Pacific Viewpoint

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The Origin, Nature, and Distribution of Agricultural Terracing

J. E. SPENCER and G. A. HALE

Among geographers concerned with the works of man on the surface of the earth, there are several categories of phenomena that have attracted attention as the chief forms of human imprint. Many geographers have concerned themselves with settlements as features producing the most significant and permanent imprint. Others have considered the combined stamp of agricultural clearing of wild vegetation and the elaboration of domestic planting patterns. To some the use of fire in destroying the forests of the earth and in inducing the spread of grasslands is a major tool in impressing a human mark on the surface of the earth. Soil erosion produced by agriculture and other types of culturally induced erosion appear to some students as the chief human mark. In the modern era there is some validity in the suggestion that the patterns of trails, roads, and highways, recently involving the great freeway or throughway systems, are becoming significant marks of human modification of the surface of the earth.

Rather curiously there has been profound neglect for another of the great categories of alteration of the surface of the earth — the agricultural terracing that is spread so widely. Most geographers who have considered the terrace have viewed it as the expression of the influence of environment on man, with the conclusion that where flat lands suitable for agriculture do not naturally exist man has been forced to create such surfaces artificially. Photographs of a very small number of classic illustrations of wondrously terraced slopes normally are exhibited as proof of this thesis, the most famous single case being that of the Ifugao terraces at Banaue, northern Luzon, in the Philippines. Students not caring to expound this particular thesis usually have ignored the matter of terracing, accepting it almost without comment as an incidental and unimportant phenomenon in the development of the agricultural landscape and, in this respect, are like the hardrock geologists who totally disregard alluvium.

It is the suggestion of this article that agricultural terracing constitutes one very important category of phenomena stamping the perman-

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J. E. Spencer is Professor of Geography at the University of California, Los Angeles.

G. A. Hale is a graduate student in the Department of Geography, University of California, Los Angeles.

ent imprint of man on the surface of the earth. Terracing is here viewed as expressing a cultural technological ability of man carried out to improve upon the natural landscape rather than as expressing the influence of environment over man. Agricultural terracing transforms the natural slope of landforms, alters the patterns of natural drainage, changes the profiles and development of soils, counteracts natural cycles of erosion, produces culturally controlled sedimentation and the growth of softer than natural landform profiles, and produces a cultural landscape more valuable to man that the one provided by nature. The distribution of terracing does not agree at all with the distribution of agriculture in the rough lands of the earth so that it is a matter of culture rather than one of environmental influence. Agricultural terracing has a very old history in the hand of man, and today is very widespread over the world. As such an important imprint it deserves far more attention than it has received from all disciplines concerned with human occupation of the earth.

The terracing traditions, as such, appear to be clearly differentiated from the major traditions of hydraulic engineering, though at a late date in some areas the two met and became partially integrated. Certainly the early development of terracing did not take place in the great river valleys where the chief expressions of flood control are to be found. The major hydraulic situations involved concentrated political power, large volumes of labour, large flat landscapes, and large-scale works, whereas the early story of terracing, if not the whole story, is related to local situations, activity by individuals or small groups, acting in co-operation but not in centralised schemes, and to landscapes marginal to the great lowlands. It is only late in the development of terracing traditions that the terrace spread out on to such major lowlands as were already protected by hydraulic works. [1]

DEFINITIONS, PRESCRIPTIONS, AND LIMITATIONS

Our English word terrace, in one usage, signifies an artificially flattened surface whose plane is more horizontal than the plane of the natural land surface originally present. The term expresses no horizontal dimensions, contains no quality reference, does not define the procedure by which the flattening is produced, and says nothing about its use. It is necessary, therefore, to prescribe frames of reference for the discussion of agricultural terracing. In the strict sense of the term

[1] Wittfogel (1957) makes no mention of terracing. Terracing was but little associated with the lowlands of the Nile Valley, the Tigris–Euphrates, the Indus, or the Yellow River in the early period. It comes late into the lowlands of the Ganges Valley, the Yangtze Valley, and the great river valleys of southeastern Asia.

there are many kinds of surfaces which, conceivably, may be termed terraces. Obviously omitted from consideration are terraces built for the erection of buildings, terraces involved with military fortifications, and terraces designed for recreational, ceremonial, and other such non-agricultural uses. In simplest terms the agricultural terrace may be conceived as any artificially flattened surface on which crops are grown subsequent to the flattening, no matter how small, how crude, or how purposeful. In this simple description there are many sorts of surface flattening, and many ways of achieving it, that properly lie outside our discussion.

The placement of any kind of obstruction laterally across a slope will induce accumulation of mineral and organic soil material behind it, resulting in a flattening of a portion of the surface of the slope. Rocks can be laid in rows, the soil surface may be slightly scarified, brush may be piled in lines, felled tree trunks may be aligned to some degree, or fences may be built laterally. Lateral paths used by cultivators and by domestic animals in their grazing may create flattening of slopes. The very patterns of planting adopted by some peoples on many occasions achieves a certain element of slope flattening. Such incipient terracing may be found almost all over the agricultural world. The very simplest, and possibly the first, of human efforts at terracing may have been little more than such activities. Though we will return to the subject of incipient terracing, it is not with such elemental activities that this article is concerned.

The consideration of true agricultural terracing separates itself into two parts at the outset. First are the ancient techniques of terrace building, widely distributed over the world but being only slightly employed in the elaboration of agricultural landscapes in the present century.[2] Second are the modern and contemporary techniques of contour cultivation, employing mechanical equipment and creating a different order of terracing. The latter system has achieved wide distribution already, is still expanding rapidly, and, in many areas, is superseding the older techniques and types of terracing in the expansion of agriculture on to new lands.

This article constitutes an enquiry into the nature and the origins of the older order of terracing, concerning itself with the classification of different purposes of terraces, their possible origins, and with the distribution of the traditional variety of terracing. It must be considered a very preliminary enquiry, for the investigation of, and the literature pertaining to, the nature and building of terraces is singularly small. Many writers concerned with landscapes in many parts of the world

[2] A notable exception is the Communist Chinese mobilisation of local labour to greatly expand the traditional terrace patterns of northwest China as an element of flood control and reforestation. Buchanan (1960): 22–6.

have failed even to mention the presence of terracing in the landscapes they treat.

THE NATURE AND FORMS OF TRADITIONAL TERRACING

Since there are many kinds of agricultural terraces in many kinds of environments, they must be examined from several points of view, even though the end purpose of all terracing is to make cropping more possible, more productive and easier. Any agricultural terrace may be considered in two different ways. It may be viewed functionally as the field surface created by the act of terracing, leading to the recognition of different kinds of fields with different degrees of horizontality, usable in different ways. Alternatively the terrace may be viewed technologically as the artificially compounded device designed and executed to produce a field in different ways, leading to the recognition of several kinds of technological procedures employed in creating agricultural terraces. Individual final consideration of a terrace must, of course, integrate the alternative views to permit recognition of an end product, a specific type of terrace, built in a given way, to produce a crop field that can be operated in a particular manner in a specific ecologic situation.

Traditional terracing procedures must be approached from the standpoint of simple beginnings and initial aims, with consideration of the varying physical environments in which the first developments may have occurred. Even the first simple efforts at terracing must have been carried out to yield cropping surfaces better than those available on the natural surfaces of the land. This involves recognition of landforms, the nature of the regolith, the character of soils, precipitation regimes, and the nature of surface waters. But it also involves consideration of cultural organisation, general abilities, and technical skills.

A tentative listing of the most general aims of all agricultural terracers, in all kinds of geographic environments, among all levels of culture, yields the following series:

(a) Procedures creating cropping surfaces initially little modified from the natural surface, the cropping of which must depend upon spreading naturally flowing water over the field surfaces to provide ground water for crop growth.

(b) Procedures creating cropping surfaces more horizontal than those occurring naturally, the cropping of which could depend upon natural precipitation only.

(c) Procedures creating cropping surfaces more horizontal than those occurring naturally, the cropping of which could depend upon water diverted from natural streams and introduced through irri-

gation channels to the cropping area.

(d) Procedures achieving retention of soils on existing cropping surfaces, questions of soil moisture being initially secondary.

(e) Procedures creating cropping surfaces in terrain not naturally arable in its rocky condition, questions of soil moisture initially being secondary.

(f) Procedures creating horizontal surfaces on which water may be impounded for the establishment of wet fields, on which water stands at some desired depth during the cropping period.

It follows that once terracing had been started in any area, the human recognition of possibilities may have led to a combining of two different aims in the same area, permitting the extension of terracing through a hybrid terrace type designed to achieve both aims. It follows also that with experience, increasing skills, and additional manpower, an initial simple aim may have evolved into a more complex aim, giving rise to technological modification which enabled the building of terraces in areas in which they originally could not have been built. It must also be recognised that if a general aim in terracing were applied to a different environment the aim itself might be altered. If this occurred in the hands of the skilled builder of terraces, advancing technological change might yield a new kind of terrace. But if the technique of terrace building were copied by another people not previously acquainted with terracing, the alteration of the aim under less able technology might well have been toward initial simplification, also giving rise to a new kind of terrace but in a recessive line of development. The later history of agricultural terrace building may well involve many such deviational developments, yielding both more advanced and simpler terracing procedures.

Since it is as yet uncertain where agricultural terracing began, what the initial aims of the first terracers were, and what technological devices were initially employed, it is impossible to set up a firm series of terrace categories, either in evolutionary sequence or in regional sequences. It is, then, necessary to project the possible products of general aims into a listing of the different specific kinds of terraces that may have been constructed over the long period of terrace building. Without attempting to develop every theoretical permutation, but with the aim of including types of terraces for which we have found record, the following tentative list may be set down:

1. The low, simple, and gently sloping terrace built in an open and non-entrenched drainage channel, employing a simple weir to spread naturally flowing water over a wider than natural surface, in such manner as to soak the surface and cause the accumulation of silt. The weir may be of rocks, earth, and vegetative material in any uniform or mixed pattern of composition.
2. The high terrace built in a narrow drainage channel in an area

of marked relief, employing a massive stone barrage across the channel which causes silting behind it to produce a small field, nearly horizontal and periodically soaked by naturally flowing water.

3. The rock-embanked but non-contour terrace with a sloping field laid out across a slope, without facilities for artificial water, dependent upon natural precipitation for soil water.
4. The isolated, short, single field terrace created by crude rock embankment and by back-slope digging and fore-slope filling, to create a single small but less steep field, dependent upon natural precipitation for soil water.
5. The rock-embanked contour terrace with gently sloping field, starting near a stream channel from which irrigation water may be diverted to irrigate the terrace.
6. The rock-embanked buttress or bastion terrace, built laterally across a slope, making no attempt to create a true field, but supporting crop trees on slopes.
7. The low, simple, mud-walled terrace built on a flat-floored stream bed, sometimes reinforced with stone and vegetative materials, impounding naturally flowing water to create wet fields which hold water during the growing season.
8. The contour terrace laid out laterally across slopes, with a truly horizontal field, using embankments to impound water on wet fields, dependent upon water derived from a higher terrace or upland source.
9. The aquatic field-pond created by excavation or by mud embankments less than dam-size, within a wet field terrace zone, to serve as an aquatic field and as a source of water for other wet fields above or below.
10. The excavated pit field dug into a surface to create a wet-soil field closer to the water table.

There may be other specific terrace types which should be added to the above list. Of the purposes suggested in the foregoing list of general aims all cannot be met by precisely the same form, shape, and construction of terrace, so that there must be many different kinds of terracing. It is true that, superficially, many of the varieties of terraces appear very much alike, in the same way that almost all people, houses, or automobiles have superficial similarities. It certainly is true, of course, that a given type of terrace construction may serve more than one general purpose in certain environments. It is equally true that in any given environment the builders of terraces have sought to achieve only a few of the varieties of purposes for which terraces may be built. The terrace built for a specific purpose in a given situation in a particular environment is something tailored to its location by its builders, and it is necessary to analyse both the terrace

patterns and the situations in which terraces are constructed. Relatively slight modifications in the technical construction of a terrace may serve to alter its purpose. For example, a slight alteration in the height of the earth fill behind an embankment can transform any horizontal terrace pattern into a pattern designed for either a wet or a dry field.

The descriptive technical elements, and the corresponding situations, are suggestively spelled out in the following sections, whose numbers correspond to the numbers previously listed.

(1) *Channel-bottom, weir terrace.* What may be one of the very simplest forms of true terracing is that produced by a simple weir built laterally across the bed of a shallow water course which is not entrenched, and which normally would not carry a large head of water. [3] Such a terrace is to be found across flow lines of slight gradient near lowland margins, wherein apron surfaces lie adjacent to the drainage channel. [4] The weir was built low and only a very slight amount of labour was involved in making the field a planting surface. The ponding of naturally flowing water produced a certain element of sedimentation, further levelling the surface, thus requiring little in the way of formal terrace-filling operations.

In this type of terracing no attempt was made to create a level field, for the purpose appears to have been to spread the natural flow of water over a wide surface, to provide sufficient soil moisture for the growing of crops. The deposition of silt over the surface must originally have been an incidental item, but capitalised upon, and eventually fostered. Surplus water was permitted to proceed down-

[3] There are too few common words, well defined, that are roughly equivalent to dam and embankment. In this article the term *weir* is used for any check dam built up to or near to the level of the field behind it, used in situations in which free flowing water purposely is permitted to flow over the dam to the field below. The term *barrage* will be used only for a thick dam, double-faced with rock and filled with earth, erected to impound a considerable depth of water to produce sedimentation behind the embankment. A formal spillway, paved with stone, is a normal accompaniment of the mature technology. The term *wall* will be used for any embankment built to the level of the field behind it in situations in which free flowing water would not normally flow over it to the field below. The term *bund* will be restricted to the embankment built above the level of the field behind it for the purpose of impounding water on the field during the growing season, thus to create a wet field rather than to produce sedimentation. The term *bund* in English-language usage in eastern and southern Asia, does have other application also (the dam of reservoir, the front margin of an artificially reinforced river bank, the flat top surface of that river bank), but it is the common term by which to refer to the rice field embankment. The term *embankment* will be used in the purely general sense, applicable to any of the specific forms.

[4] Bury (1919): 101-3, briefly discusses this type of terrace in the Tihama of Yemen.

grade to the next terrace unit along the original flow line. Small to moderate sized fan-shaped fields resulted from this type of terracing, with the numbers of units ranging from two or three to dozens. Such terraces appear in the very dry areas of the Near East in areas of low local relief, in which crop maturity could not depend upon natural precipitation. It possibly represents one of the very simplest and earliest forms of terracing. How widely distributed this form of the terrace may have been at one time is not clear. At first glance it may appear to be an arid land terrace applicable only to the flat, open margins of hill country, but terrace type (7) is almost identical in general nature, simplicity, and pattern, though it is applied to a different end. The channel-bottom, weir terrace probably served as the model for another terrace, type (2).

(2) *Narrow channel, barrage terrace.* In the rougher hill country of parts of the Negev, in southern Israel, there are hamada-paved uplands, with stream channels cut into the surfaces, producing considerable local relief, and there are few flat areas easily cultivable and provided with water in this arid land. Aligned along drainage courses today appear hundreds of terraced fields. These were produced by building massive stone barrages right across the narrow channels. Removal of hamada-paving from uplands increased erosional action thereon, bringing volumes of sediment down with the runoff of random rains which deposited a thick layer of material behind each barrage. In time this became thick enough to provide a cultivable field, watered by the periodic natural flow of drainage water.[5] Eventually the barrages became filled, and the process could be extended on downstream, or further upward.

The distribution of this kind of terrace is poorly reported. It appears to be a type belonging to a very arid region, wherein natural precipitation is too slight to mature crops. It is applicable to areas of quite varied local relief. It certainly cannot be a first step in terracing, because the construction of the massive stone barrage is not something that could be done without considerable stone-working technology.[6]

(3) *Linear sloping, dry field terrace.* Crude stone walls may be built laterally across sloping surfaces, accompanied by back-slope digging and earth filling of the fore-section against the embankment to produce flattened fields. No attempt may be made to produce a field which is essentially horizontal but merely one which is flatter than the

[5] Kedar (1957A): 186.

[6] Evenari, Aharoni, Shanan, and Tadmore (1958): 231-43, investigated Judean period (850-600 B.C.) terrace remnants in the Negev which were cruder and simpler in their construction than the later Nabataean, Roman, and Byzantine terraces. Further investigation may push terracing much farther back in time, and may permit us to see a sequential development of the narrow channel, barrage terrace.

original surface. This results in a field surface which may have a considerable forward slope to the wall, and which may have considerable longitudinal variation in level, and is not a contour terrace properly speaking. When built in regions having a considerable precipitation, which can mature crops without artificial water, levelness is not a prerequisite for a successful terrace of this type. Such terraces may be built in areas with no facilities for irrigation, since the absorption of natural precipitation will be adequate to support crop growth, be it field crops, shrubs, or trees, and whether it be by dry-farm practice, precipitation-season cropping, or normal summer growing season cropping.

This terrace would appear to have originated in some region having a seasonally moderate precipitation regime. It became applicable to many different kinds of situations, and to many different varieties of local relief as its technology matured. Efficient construction of the embankment could carry it into quite rugged areas. Such terraces are distributed widely over the world, and the form appears to be one of the most common varieties of terracing in areas with precipitation regimes adequate to producing crops without irrigation.

(4) *Isolated, short, sloping dry field terrace.* In several regions terracing does not produce serried rows across a whole slope, but yields isolated and single terrace fields, scattered at random over a slope. Such terraces are flatter than the natural slope, and represent individual efforts of a small order, confined to a single field, the expression of continued occupance of a given site. In such cases apparently slope cultivation is first practised, but in time the beginnings of rough terraces take shape. Over the years the front walls are raised progressively by the placement of crude stone blocks, and back-slopes are dug down to fill the front portions. This form of the terrace can never produce a horizontal field, and its technology is both crude and simple.

Perhaps this is a transitional form of terracing in the hands of some people not highly skilled in stone work and terrace building in general so that it may be a variety of its own. Western China, could achieve technologically careful and wholesale terracing. But it appears also that it may be the full expression of terracing among a people not high skilled in stone work and terrace building in general, so that it may be a variety of its own. Western China, Himalayan India, and portions of Southeast Asia show this type of terracing, but its wider distribution is uncertain. In Himalayan India shifting cultivation on fairly steep slopes often is succeeded by permanent field agriculture employing this kind of terracing to produce a field easier to work. [7]

[7] Pant (1935): 87.

(5) *Linear contour, irrigable terrace.* By the building of a stone wall laterally across a slope on the contour, and by filling it with earth to form a nearly horizontal field with a slight end-to-end gradient, an irrigable field is created. The fill does not have to be truly horizontal in any direction, but it should maintain only slight gradients outward and longitudinally. This type of terrace will absorb such precipitation as normally falls on it as light to heavy rains, but it will not absorb extended heavy downpours of rain. When it is built in areas having frequent heavy rains there must be the provision of drains to dispose of surpluses of water not essential to the use of the terrace. By its construction it is a type of terrace that permits relatively easy irrigation, providing a source of water is available at all.

Perhaps this terrace type originated in areas lacking quite enough natural precipitation to mature desired crops, but having water in streams, drainage channels, or in springs. The building of a small rock wall down contour, away from such a source, and filling it properly, would produce a field requiring only a very short and simple diversion channel to get water on to the terrace. As seen today in many parts of the Middle East, such terraces begin close to water sources, with heavy rock embankments near the sources, the walls thinning out away from the source, with the field sometimes losing its smooth contour at a distance from the water source.

This type of terrace obviously is one depending upon irrigation, and would seem to have developed in areas with too little precipitation for successful cropping by the use of terrace type (3), above. The mature development of this terrace type shows elaborate handling of water devices.[8] Series of such terraces can line a slope, particularly where a rough upland provides a source of water.[9] This is perhaps the most common form of terrace in many of the foothill portions of semi-arid upland sections of the Old World. A great many of the New World terraces appear to be of this type, and many such Andean terraces are provided with elaborate drain systems to remove unwanted surpluses of water.[10] The full distribution of this type of terrace is imperfectly reported, frequently being confused with terrace type (3).

(6) *Tree-crop, buttress terrace.* When long-lived crop trees or shrubs are grown on essentially sloping lands, rain wash, soil erosion, and under-cutting may expose roots, weaken ground supports, and otherwise cause the decline, fall, or death of the trees and shrubs. In many such situations terracing of a sort is done to provide permanent support for the desired plants rather than to produce a full crop field. In such cases irregular or semi-continuous walls are built that produce a terrace

[8] Swanson (1955): 126-7; Hall (1909): 236.
[9] Haig (1887): 482.
[10] Swanson (1955): 126-7.

effect without producing full terraces. Such walls often have a high batter, or rearward slope, and the walls commonly do not fully enclose the bases of trees.[11] Such terracing is common in the whole of the Mediterranean Basin and the Middle East, but its further distribution is not well reported. It would appear to be a derivative of simple terracing effected for a specific purpose of erosion control.

(7) *Stream bed, wet field, mud terrace.* In portions of the Orient in the modern period there are some culture groups which have not used the full wet field terracing complex described below, but who do grow wet rice on wet fields on flat valley floors and other appropriate surfaces. Simple mud bunds, with informal sluicing gates, parts of the construction sometimes casually reinforced with stones, tree branches, bamboo, and other plant material, create wet fields in, along, or next to, lines of stream flow. Frequently almost no real filling or levelling is done to field surfaces, though natural silting under partially controlled water conditions does assist the levelling procedure. Unusual heads of water may wash out parts of the construction, or sweep the whole away, but crops often can be harvested without significant losses. This may have been a local development, or it might be the translation of the Near Eastern channel-bottom, weir terrace (1) into local ecologic situations. This is very simple terracing, involving little acute technology, and may be considered not to constitute proper terracing at all.[12]

The earlier distribution of such simple terracing cannot now be determined, since such simple patterns were long ago absorbed and submerged into the much more complex wet field terrace systems that cover the whole of valley bottom landscapes in many portions of the Orient, but the simpler elements may have been the base on which much of the later terrace complexes were built in many areas.

(8) *The wet field terrace.* Wet field terracing is truly horizontal field creation, and there are two distinct differences between it and previous varieties of terracing. First, the front embankment must be carried to a level above the fill material, providing a dam capable

[11] Observed by the junior author in Lebanon, especially in regard to olive trees.

[12] Among others, the Khasi used to practise something very similar to this around the margins of the Khasi Hills in northeastern India. Perry (1916): 14, considered this to be irrigated terracing. Hutton (1921): 393, argued that the Khasi practice was not terracing, since the Khasi had to be taught to terrace. Obviously the ability to build stream bed, wet field mud terraces did not automatically enable the Khasi to build the more complex wet field terracing systems built by other peoples such as Hutton had in mind. The Khasi practice, and others like it, certainly is not advanced and complex terracing, and it may have constituted a crude and down-scaled simplification of true terracing, but in our preliminary judgement the type of terracing done by the Khasis belongs in the broad discussion of terracing in general, and does constitute an elementary type.

of impounding water, but also capable of disposing of unwanted water. The bund seldom is constructed more than a few inches above the intended water level, but it must be proof against leakage. A critical element in bund construction is the provision of openings, sluices, or spillways, since good wet field terracing never uses the weir. The second difference lies in the filling of the terrace. The terrace behind the bund must be sufficiently carefully levelled that no more than a few inches of water are required to cover the whole of the field surface. If this is not done, growing conditions will be unequal, crops will not yield evenly, and they will not mature evenly.

Efficient wet field terracing is far more complex than is most dry field terracing. The complexity lies not in the construction of the bund, in most cases, nor in the levelling of the fill, but in the accompanying water control that is mandatorily efficient if a large terrace series is to be operated successfully. The provision of sufficient water for the whole of a series of terraces, often running into the hundreds in sequential arrangement down a slope, the regulation of flow patterns, the disposal of surpluses at needed points, the introduction of additional volumes, and the provision for flood situations makes wet field terracing both a co-operative and an exacting science.

Wet field terracing appears indigenous to some part of the Orient, but it is doubtful if the original and essential concepts of terrace building are indigenous to the Orient. Rather the wet field terrace would appear to be a modification evolved to suit the conditions of a particular cropping pattern. The spread of wet field terracing outside the Orient in earlier times was very limited, but in the modern period the concept has spread very widely indeed.

(9) *Aquatic field pond.* Within many sequences of wet fields there is deliberate terracing for the establishment of a shallow reservoir-like unit of water which normally has multiple use. Sometimes the bund of this unit becomes a true dam, being far thicker at the base than the normal field bund, but this is not always the case. The shallowness of the pond permits its cropping by the use of a variety of aquatic plants, fish, and shellfish. Its purpose, as water supply, is the provision of water to fields below or above the pond, but it is almost never just a reservoir, having aquatic cropping purposes as well. The distribution of this form of terracing, admittedly a special case, has been only partial within the zone of the wet field terrace. [13]

(10) *Sunken, taro-pit terrace.* The taro pit is an excavated field set below the general level of the land in order to bring the field surface nearer to a natural water table, and to impound rain water to assist

[13] Not included in this concept is the true reservoir, known as the tank, of India and Ceylon. The tank often is found along a stream valley, sandwiched in between several sets of wet fields, but its essential purpose differs from that of the aquatic field pond.

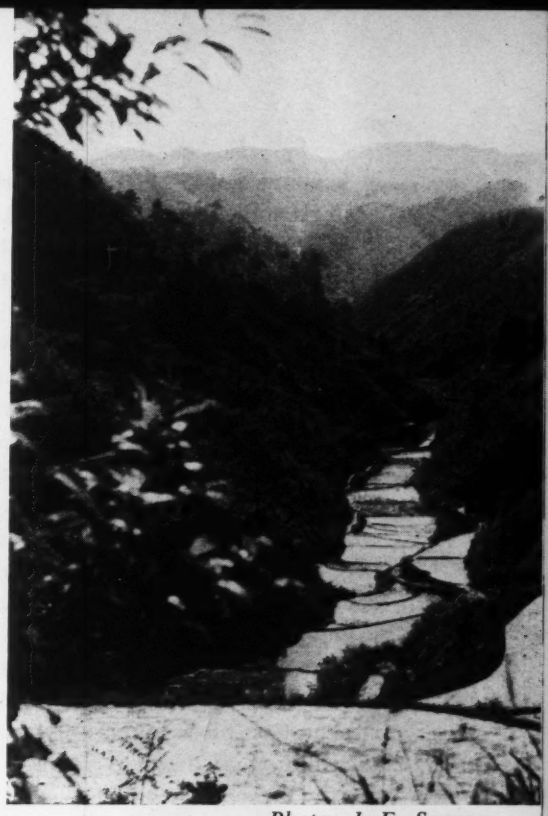


Fig. 1. A narrow stream valley head, with wet field terraces filling whole channel bottom. No drainage field lies above top terrace, hence no channel parallels terrace series until just below lowest visible field. Bunds are simple mud embankments. Western Hupei, China.

Photo: J. E. Spencer

Fig. 2. Four wet field terraces with simple mud bunds, in centre, showing wash-outs, temporary repairs, and field irregularities resulting from silting. The fourth, upper terrace now lacks water. Linear sloping, dry field terraces in background. Foreground terraces are wet field terraces in form, now planted as dry fields. Western Szechwan, China.

Photo: J. E. Spencer

in keeping a wet-soil field in sufficiently moist condition to grow taro. Though sunken and constituting a potential pond, its essential purpose is not to impound water, but to lower the surface of the field to a point nearer the ground water table. Such a pit field appears to be a sort of reverse terracing, for such fields are generally quite level spaces in the midst of dry fields on rolling to irregular surfaces. There is some evidence that at one time some taro pits were sequentially arranged, but this was not everywhere the case, and the patterns of such fields have deteriorated in recent centuries.[14] It is unclear whether the taro-pit is a marginal form of terracing, or whether it belongs at all within the wider concept of terracing. Since it does create an element of an artificial landscape, the taro-pit is included here as a suggestion that it may be within or related to the essential concepts of terracing as a procedure modifying natural land surfaces in developing cropping surfaces.

The traditional wet field often is used to grow taro on the mainland of southeastern Asia, in the Philippines, and in the Indies, but the sunken taro-pit is found only occasionally on the mainland. The regional distribution of the taro-pit properly belongs to the Islands of the open Pacific Ocean, but its full distribution is little reported.[15]

The above sections set forth various portions of a hierarchy of terracing, with some suggestions as to genetic relationships, but we are by no means convinced of the completeness, accuracy, or the order of relationships. The scarcity of critical examination of terracing as a technological complex, and the lack of distributional data on the varied forms precludes definitive classification at this writing. It seems to us that for true terracing, channel-bottom, weir terracing is elementary and a possible starting point for at least one portion of terracing, and that the narrow channel, barrage terrace is a second-step, or third-step, form evolved and adapted for use in arid lands of marked relief. The isolated, short, sloping dry field terrace appears to be a transitional form, perhaps a starting point for the full-scale development of the linear sloping, dry field terrace systems. Full scale wet field terracing is technologically highly advanced, and it appears to be a late development, but exactly where other terrace forms fit in, and how many there may be, remains to be proven.

[14] Murphy (1950): 62-6, illustrates present Micronesian usage. Skottsburg (1920): 13, mentions pit fields for growing bananas on Easter Island, but the relation of these to the taro-pit field is uncertain; Metraux (1957): 63-4, emphasises their role of providing shelter from cold sea winds for plants such as banana and taro.

[15] Little attention has been given to taro fields technologically. Hocart (1929): 107, typically comments on two former methods of growing taro, one of which involved pits; Brown (1927): Vol. 1, 145, remarks on taro pits ten feet deep to get at available moisture, but says nothing more about them. Many authors who mention taro make no comment on the fields.

It is clear that elementary terracing of any particular type may be done by a particular people long after the technological style originated, for there is ample illustration of all degrees of understanding and execution of different forms of terracing within the recent historical period. It is obvious that the origins of terracing lie far back in time, but terraces present less dramatic and less potentially productive sites for archaeological digs than do settlement sites, so that there has been little attempt to date terracing. There is little by which terracing can be dated, using the traditional techniques, and succeeding peoples repeatedly have taken over the terraced landscapes of their predecessors. Perhaps it might be possible by some of the newer dating procedures to find materials that could be subjected to date determinations, even in terraces.

We have made our suggestions of terrace types as specifically as possible in the hope that field observers will examine terraces and terracing, the better to map their distributions, typologies, and technologies. It is not to be expected that terracing everywhere will fit precisely into the patterns of the major types presented, for terraces must be tailored to their physical landscapes, and must be adapted to their rainfall regimes; there undoubtedly are terraces whose purposes cross the lines between types, and whose execution falls short of the technology required for a particular style.

THE CONSTRUCTION OF WEIRS, BARRAGES, WALLS, AND BUNDS, AND THE TERRACE FILLING TECHNIQUES

In the building of terracing the purpose of the terrace and the kind of site chosen are critically important. The 'style' of the retaining medium, weir, barrage, wall, or bund is the critical element if terracing is to be effective and permanent. Though incipient terracing may use almost any kind of material in the obstruction behind which the fill accumulates, it appears that there are only two primary kinds of materials used in the building of true terrace embankments, stone and earth.[16] A third general situation does exist, in which the country

[16] Best (1925): 117, quoting E. J. Wakefield, *Adventure in New Zealand*, Christchurch, 1908, describes log-embanked terraces supported by large pegs; Barrau (1958): 41-2, mentions both tree trunks and vertical lines of sticks being used; Brass (1941): 565-8, comments that logs sometimes are used on newly cleared land, later being replaced by stone; Pant (1935): 91, mentions the occasional use of logs. The first three pertain to the Pacific, the fourth to the Himalayas; it is likely that the use of wood was related to shifting cultivation and to incipient terracing originally, being occasionally employed after true terracing was learned. We have not found log embankment mentioned as employed anywhere with advanced and complex terracing technologies, and consider it an elementary and occasional feature.

matrix of the regolith is firm enough that terraces can be carved out of material *in situ,* but this is a special case permitting the more rapid expansion of established terrace patterns rather than a case related to the genetic evolution of terracing. At least we think, at present, that this is so — a situation taken advantage of when the technology had already become established and mastered.

The most common material used in building embankments for terracing the world around is stone, laid in dry-wall construction.[17] In its most common form the dry-wall is a wall in which stones are laid without mortar, involving a variable amount of fitting blocks, boulders, and stones together to form a strong embankment. When working in slates and other rectangularly fractured stone, no working of the stone is required, since simple sorting of slabs can find those producing sufficient fit to produce the desired result. With stone not naturally rectangularly fractured, some working is required. This may amount to knocking off projecting corners, splitting large blocks, chipping edges, and so on, to produce slab-units. In very early work this must have been crudely done, but the refinement of stone working among many peoples is an old technique, and the art of stone working has widely diffused over the world.[18] Refinement of dry-wall techniques can, of course, develop a high degree of exactitude, with precise cutting, matching, fitting, and smoothing of stone faces, even for terrace embankment construction. Normally embankments are built with some degree of batter, or rearward slope, the degree of batter depending upon the height of the embankment, and the amount of working given the rough stone. The filling immediately behind the face-wall often finds a second row of stones, or the small stone, the chipped-off fragments, and the general rubble used to chink the holes left by the primary blocks.

It is the durable stone dry-wall, skilfully fashioned, that today preserves so much of the terracing that has been done throughout the world, creating permanently modified physical landscapes. There must have been considerable early development of terracing, somewhat in-

[17] There are scattered reports, such as that of Helfitz (1958): 159-60, referring to wall terracing in which mortar is used to bind the stones. Current repairs are to traditional terracing, inferring the continuation of an old technique; in other references to the use of mortar in embankments there is often the suspicion that it is modern only. The distribution of mortared terracing of the traditional sort is poorly reported.

[18] Perry (1915): 15-7. There is repeated inference as to the correlation of the distribution of stone-embanked cultivation terraces with that of megalithic stone work in general, as in Beyer (1955): 387-98. Whether this relationship is direct, indirect, coincidental, or a result of incomplete and faulty mapping, still is impossible to conclude. Is it possible that the correlation is one of convergence, one complementing the other once the two technologies became associated?

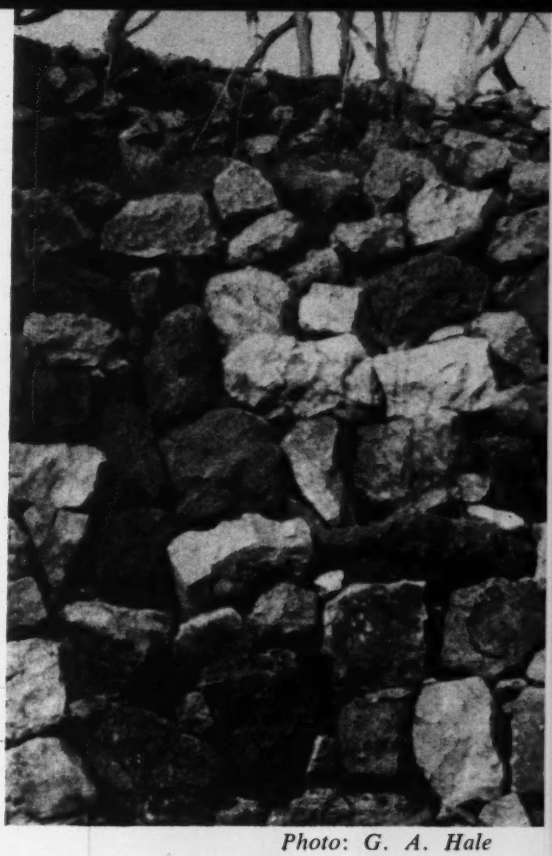


Fig. 3. The detail of a dry-wall terrace embankment for a linear contour, irrigated terrace running across the photo, with the sloping surface of another visible in background, planted to grapes. Slopes of Mt. Lebanon, above Beirut, Lebanon.

Photo: *G. A. Hale*

Fig. 4. Linear sloping, dryfield terraces. No terraces currently in annual crop. Background terraces planted to olives. Slopes of Mt. Lebanon, southeast of Beirut, Lebanon.

Photo: *G. A. Hale*

cipient in nature, that was done prior to, or without, the use of stone, or without the technique of good construction of the dry-wall, that has not been effectively preserved. Presumably much of this has been rebuilt or has disappeared, and no longer remains as terracing at all. In most of the Middle East, the Mediterranean Basin, northern Europe, and eastern Africa, and in a major share of the New World, terracing is almost synonymous with stone embankments. Eastward across Asia the tradition of terracing with stone embankments is found very widely, extending out into the Pacific, but not all east Asian terracing employs stone as the retaining medium.

It is likely that embankments of stone at first were both crudely fashioned and low in height, and were executed on relatively slight slopes. As experience and skill accumulated the heights of embankments increased, and slopes with higher gradients could be tackled. The narrowing width of the terrace has a relationship to the height of the wall, modified by the skill of the fashioner in laying the stone. Primitive engineering practice seems early to have worked out effective solutions to the problems of weight of fill, width of terrace, height of embankment, and degree of batter given the wall, so as to produce sound and permanent construction. Excessive terrace widths, or excessive heights of embankments, involve larger and larger amounts of fill material and volumes of stone, markedly increasing the problems of engineering the construction. But economic considerations must also have entered, involving the labour costs of providing fill and stone. No standard solutions for these problems appear to have resulted, but rule-of-thumb patterns appear in various parts of the world. East African terraces appear narrow and not generally very high, though stone work in fortifications reaches impressive heights and volumes.[19] Among the north Luzon terracers of the Philippines, on the other hand, heights of embankments are impressive, sometimes with exceedingly narrow terraces, and in the Andean New World occasional fine stone work produced both high embankments and narrow terraces.[20] Much of the Himalayan hill country terracing uses only very crude stone techniques, with little working of stone, and exhibits very little engineering skill, still achieving a specific kind of purpose.[21]

In areas having marked dry seasons terrace embankment literally necessitates the employment of stone to achieve permanent construction. No vegetative materials, and no employment of earth alone, can give permanence, though for strictly temporary expedients in repairing

[19] See repeated references in chapters on East Africa in Davidson (1959) and Murdoch (1959).

[20] For the Philippines this is based on personal observation and inspection by the senior author; for the Andes see Swanson (1955): 125-6.

[21] Pant (1935): 90-4.

breaks almost anything will serve. The drying out of soil, and its vulnerability to erosion when dry and bare, requires the employment of stone to achieve permanent construction. In perennially humid regions, purposeful compaction of soil and the use of turf-forming grasses does permit the use of earth embankments, but these appear to be a late development rather than a technique going with terrace origination.

What appears to be some of the oldest of eastern Asian terracing employs the stone embankment built in the same manner as in the Middle East. But as the wet field terrace concept evolved, it would appear, the growth of turf and sod-forming short grasses, as unwanted weed growth around terrace margins, presented an alternative to embankment building. The use of the mud embankment for the wet field has been the most common accompaniment of eastern Asian terracing. Just how long this development took is not at all clear. It is clear, however, that wherever physically possible late East Asian wet field terracing has normally employed the mud embankment covered with growing sod grasses, and uses stone only where earth will not withstand pressures of weight and erosion. That wet field terrace bunds could be built of simple earth, allowing the spread of sod-forming grasses as surface-binder, enormously cheapened the costs of construction of wet field terracing, and decreased the order of skills required of the builders. Once the procedure became well developed, wet field terracing could spread rapidly over valley floors and on to any lands covered thickly with a mantle of weathered soil material.

In the wet field terrace systems developed in recent centuries among most of the rice growing peoples it has been traditional to build mud embankments into desired shapes, to permit the natural spread of sod-forming short grasses over the upper surfaces of the bunds, and to create a permanent cover which is never removed. Even in areas with fairly marked dry seasons, and in areas in which growth stops owing to cold weather, the sod remains in place as a binder, the moisture of the fields being sufficient to promote year-round growth or to keep the grasses alive. The grazing of such covers by domestic animals keeps them clean and, secondarily, provides a source of forage for the animals. In critical areas the use of stone has continued, and in many a local terrace system there may be a few spots requiring the use of stone work. In general such stone work is expedient, and seldom approaches the techniques, styles, or skills of the true-dry-wall. Not all east Asiatic rice growing peoples have taken to the newer technique, and a few still construct stone embankments in the classical manner. [22]

[22] North Luzon tribal peoples are the outstanding example. Even today the Ifugao, in the few terraces they still build, employ the classical dry-wall stone bund, carefully engineered to specific steep-sloped sites.

The filling of formally constructed terraces involves two different procedures. The first is controlled sedimentation behind embankments by using the natural flow of water, and the second involves digging, piling, and carrying of earth. We cannot, today, be certain just how widely the first method may have been employed in the past in certain areas. Use of the first technique depends upon capitalising upon natural runoff and natural sediment load in streams. What is termed *'seil* irrigation,' or floodwater irrigation, in parts of the Middle East demonstrates the technique employed in the development of one order of terracing though the technique may be conducted without achieving true terraces. [23]

Seil irrigation, when combined with a simple check dam, achieves the first of our purposes for terracing (procedure (a), p. 4), and could be the technology basically involved in the creation of our first type of terracing, 1 and (1). It is essentially this technique which was employed in the building of the narrow channel, barrage terrace, 2 and (2). At least in the Negev and related areas, there appeared the techniques of exposing the soil surface to erosive forces of rain and sheet wash to increase the transport of fill, the more rapidly to create the terrace fill. [24] We are unable to suggest how much more widely these techniques were applied, but it is likely that they were applied in other areas. [25]

The filling of terraces by direct human action appears the more commonly used filling process. In areas bearing thick mantles of regolith, filling was no doubt accomplished by back-slope digging and fore-slope filling to considerable degree, perhaps even with saving of surface soils for terrace capping. [26] However, in localities possessing only thin mantles of regolith, terrace filling requires gathering of fill material from extended surfaces of any and all nearby localities. Very widespread is the practice of carrying soil materials from stream bottoms to upland terraces. Some recent Ifugao terracers, in northern Luzon, have gathered soil by the basketful from a radius of several hundred yards above and below the terrace to be filled, with rough sorting of materials as the filling proceeds, so that surface soil caps the field surface. [27]

The replenishment of terrace fill is a normal element of continued

[23] For a discussion of the origins of terracing technology see below pp. 25-30.

[24] Rim (1954): 268; Evenari and Koller (1956): 43-4; Kedar (1957A): 186; Kedar (1957B): 184-5; one of these techniques is discussed further in the next section on auxiliary devices.

[25] See footnote [47] for comment on the possible New World occurrence of controlled sedimentation.

[26] See also the later comment on the filling of terraces by plowing on the strip lynchets of northwestern Europe.

[27] Personally observed by the senior author.

cropping activities on terraced landscapes.[28] The settling of new fill often requires a later supplementation by added material. The occasional small washout, or the more serious storm flood washout, all require the laborious refilling of terraced fields, and may involve the gathering of soil materials from some distance. Where thick mantles of regolith are present under the terrace series, the local excavation of materials may occur, but on rough surfaces with little weathered material available the painful carrying of soil upward from stream bottoms, or from long distances, becomes required.

The replenishment of the embankment stone must also be done in environments in which field stone decomposes. In established terrace landscapes this sometimes involves considerable transport, since finished terrace landscapes often contain no remaining loose stones on the surface.[29]

TECHNOLOGICAL DEVICES AUXILIARY TO TERRACING

Almost everywhere that terrace systems have been built there are employed a variety of technological devices not properly a part of terracing itself, but significantly auxiliary to the success of the particular terrace system. There are many such auxiliary features, and we comment on those that have come to our notice so far. The distribution of many auxiliary features is little reported, and further consideration of them is necessary for a fuller understanding of the whole of the concept of terracing.

In the Near East on the bare upland slopes, often just above the top-most terraces, there occur piles of rocks and pebbles, scattered at intervals.[30] These in some areas suggest piles of wall-rock gathered for another terrace wall, but somehow left unfinished. In some areas this may actually have been the case, but in other areas such piles of stone are thought merely to be the excess stone removed from, or excluded from, the terrace fill material. There is even the thought that in some cases the rock piles were purposefully placed where they are to break up the sheet flow of water on to the upper terraces in times of exceptional precipitation. Piles of stone around the roots of living trees are found, and heaps of pebbles occur around grape vines, to reduce erosion, to aid downward percolation of rain water,

[28] Bury (1915): 104, and Semple (1911): 457, comment respectively on the replenishment of terrace soils in Yemen and on many of the Mediterranean islands.

[29] Beyer (1955): 391-2, remarks on the replacement of site-derived soft stone in the Ifugao wet field bunds by hard waterworn cobblestone transported as needed from stream bottoms to upland terrace sites.

[30] Zohary (1954): 24-5.

and to serve as an evaporation-reducing mulch. It may be that some of the piles now occurring on unplanted surfaces served this latter function at an earlier time when trees and vines may have been part of a cropping sequence. In the very arid areas on the other hand, such as the Negev, the piles of pebbles were caused by the efforts to expose erodable materials to the action of the irregular rains, to assist the removal and transport to fill materials for terraces situated lower down on the flow channels.[31] Thus such stone piles may not be a part of terracing itself, but are expressions of techniques auxiliary to terracing as such.

In dry field terracing in parts of China, on upland situations of fairly marked relief, there often occur small basins below terrace levels, located at points where surface flow of precipitation runoff became concentrated. These basins appear to function as miniature settling basins, breaking up the channelled flow into rivulets that emerge from the basins in all directions, thus preventing gully erosion that would threaten destruction of the terrace series. Sediment accumulated in such basins is periodically removed and used to maintain terrace surfaces.

All wet field terracers face the problems of deficit and surplus water at varying points in a long terrace system reaching far down a slope or valley.[32] Frequently, in small valley heads, terraces are built right across the natural line of drainage flow. If the original watershed, upslope, contained a small stream the volume of water may seasonally be too large for the small number of terraces at this point, and the surplus must be diverted to a point lower down the series at which additional water is needed. In such cases a new drainage channel may be created at the break in slope at the side of valley head into which the surplus may be diverted. At particular points where two series of terraces can be spread broadly over a flattened surface there may develop a deficit point. The artificial channel through a terrace system, therefore, becomes a critically important auxiliary feature. Surpluses of water at a given point must be diverted from the terrace series when bunds are built of earth only, even if turf covered, since such excessive volumes may be too great for the simple sluice openings in bunds, and may constitute sources of erosion that sometimes do sweep out sections of bunds to cause wholesale destruction to a terrace series.

In addition to the artificial channel itself, other auxiliary elements must be built into a wet terrace system. The encouragement of quiet-pools, gravel bars, rock debris, barriers, bank vegetation, and other

[31] Kedar (1957B): 184-5.

[32] The following comments are based essentially on Chinese practices as observed in the field by the senior author. Though in general they are applicable to all wet field patterns, the explicit detail of water control techniques varies from region to region.

kinds of hindrances to erosional current built-up all must be fostered along the new water channel. To facilitate taking water out of such channels, to make up for deficits on the fields, weirs, ditches, and canals are needed and, where pumping is required, access-pools and other features must be built in.

In Ceylon there has developed a system of laying out miniature runnels on the surface of wet fields, designed to direct the flow of water fully over the fields, and to prevent primary movement directly from the in-sluice to the out-sluices, with a view to erosion control.[33] The wider distribution of such a feature is not known. It is common, elsewhere, to vary the in-and-out-sluicing of water by opening and closing, and by shifting sluice openings, the better to provide full-field coverage and reduce cutting at key points. Nevertheless, it is somewhat doubtful if the Ceylon feature is truly unique.

In some local situations, adaptable to a wet field terrace series, there is inadequate water available immediately above the terrace series. Long flume systems, ditches, and canals divert water from natural sources and convey it, often circuitously, to the terrace series. Cultural stream capture, or the diversion of headwater drainage, from one drainage system to another, is spread from the Negev to Japan, and is widely used wherever supplemental water is a factor in terrace operation. Sometimes Chinese terracing is carried so far up a slope that insufficient watershed space remains above the terracing. In such cases, after the crops are harvested, the uppermost fields will be fully dammed and turned into off-season temporary reservoirs to impound water until the next planting season, thus being unavailable for such winter cropping as may be practised locally. These are not the formal terrace ponds suggested as terracing type (9), but are simple auxiliary devices. Often the terrace fields chosen for this purpose are relatively new terraces, on which the ponding of water becomes an aid to the settling and compaction of the subsoil, thus eventually improving the quality of the terrace itself.

In portions of the Middle East, hill tops are flattened off and capped by stone structures that appear to be cisterns or reservoirs, and throughout the arid zones of the Old World related features are widespread. Cisterns, *per se,* have a wide distribution also. Whether such storage facilities were used only for domestic purposes, or also served for limited irrigation is not well known. The building of large scale, true storage reservoirs of the sort being built today across major streams, appears not to be a technique practised anywhere in the

[33] The evolution and local variation in patterns of runnels is developed in a forthcoming dissertation by Gerard Foster, University of California, Los Angeles.

ancient period in North Africa, the Middle East, or Central Asia.[34] The tank appearing in the Indian landscape, though profusely built on small streams for true water storage, neither has a major-stream equivalent, nor is it common in the Middle East; perhaps the tank is a distinctive feature of the Indian realm wherein a marked rainy season was accompanied by an equally marked dry season.

There are many auxiliary devices designed to transport water, at least some of which have application to terracing of the sort calling for irrigation water. The covered stone channels of the Negev and other parts of the Near East,[35] designed to prevent evaporation and dissipation by percolation, but perhaps also designed to prevent filling by drifting silt and sand, are paralleled in many areas by particular systems of aqueducts, qanats, and other specialised devices.[36] Though all these may have served domestic purposes also, they often are auxiliary to systems of terrace agriculture. They are far more intricate, often, in the dry world where water was scarce, than in the realm of the wet field terrace, and their relationships to the irrigable terrace systems appears more complex.

In the complex evolutions of either a compound series of wet terraces, or a comparable series of contour irrigable terraces, there is an enormous amount of water-engineering that actually becomes more intricate and complex than the engineering involved in building the terraces themselves. Thus it appears true that many peoples never fully mastered the technology of building either wet field terracing systems or contour irrigable field terracing systems. Many peoples in the vicinity of the compound terrace landscapes appear only to have been able to utilise simpler versions of terracing technologies, thus never becoming able to develop agricultural systems that were as highly advanced as those of their neighbours. Here again, we may refer to the inability of such people as the Khasi to fully develop their agricultural system to the level found among associated peoples.

In areas in which too much water is available on dry field terraces at certain times, or at certain seasons of the year, the provision for drainage eventually appeared as an auxiliary device. The actual elements of drainage amount to more than a single device, and appear extremely varied in different parts of the world. Careful stone capping of walls, small spillways, stone-lined gutter drains, diversion drains, and other specific elements are involved in the technology of getting un-

[34] Bowen (1958): 70-6. The famous dam at Marib, Yemen, was not a storage dam, as is normally stated. Instead it belonged to the category of terrace type 1 and (1).

[35] Kedar (1957A): Plate 36 A.

[36] Information on Yemen conveyed to the junior author by G. B. Cressey while both were at the American University of Beirut, 1957-8. See Rowe (1946): 211, 233.

wanted water off terraced fields. Sometimes the work involved is crude, improvised as needed, and variable in location, but in other areas it is the result of skilled handling of stone, is permanent, and is highly developed from the engineering point of view.

Associated with wet field terracing in parts of eastern Asia are drainage canals auxiliary to, or replacing, natural stream courses, whose purpose is to receive the terminal water flow off the lowest terrace of a series. When this constitutes a sump, pumping devices are required to move such water to a naturally flowing channel. Such drainage works are common in many portions of the Old World below dry field terraces, both in humid and seasonally wet environments where too great accumulation of flood waters may endanger the lowest terraces. [37]

THE POSSIBLE BEGINNINGS OF TERRACING TECHNOLOGIES

No explicit suggestion has been made, so far, toward technological beginnings of terracing as agricultural procedure, and there have been given only broad aims as motivations for terracing, to which can be added the general urge toward the creation of a field surface flatter than that provided by the original landscape. Such beginnings neither emerge clearly from simple comparisons of existing terracing, nor from preliminary reconstruction of terracing technology. The simplest true terraces now observable embody an already developed technology which, it would appear, is well beyond that of the human procedures observable among the incipient terracing actions of even the simplest of contemporary agriculture. Though it does not seem possible to formulate explicit theories which lead to all the kinds of terrace developments, a few suggestions can be made toward such theory.

Among the motivations toward terracing, we have the already mentioned urge toward a flatter surface for the field. The true utility of such a flatter field would not appear very strong to many shifting cultivators, for there are reasons why many shifting cultivators prefer slopes. A flatter field, involving considerable labour, may be presumed to be of significance only to sedentary cultivators, and it is our current opinion that the incipient terracing functions associated with shifting cultivation, of themselves, did not lead to terracing. It could well be that, among some shifting cultivators, incipient terracing might be one motivation toward the evolution of sedentary cultivation, but the present operative activities among formal shifting cultivators do not seem productive in this matter.

[37] Personal communication from Louis E. Guzman indicates that broad basin bottoms in southern Mexico also show such drainage features below the lowest terraces. See also footnote 47.

One of the motivations that has apparently led to the adoption of terracing in several parts of the world is the desire to get fields above the ground water table, or above the standing water on marshy and swampy ground, on too-wet meadows, or on the waterlogged lands of valley floors. Such motivation would derive from the desire to grow grains and other crops preferring well-drained soil conditions. This is thought to have been operative in parts of Africa,[38] and in parts of southeastern Asia. It could have been an operative factor in many flooded lowlands during an earlier era. However, it is doubtful that such a motivation could have been primary to the initial origins of terracing in general.

Those who have thought that rice, as a crop plant, originated in wet and marshy areas suggest that the terrace is a device for the controlled development of the wet field culture of rice. This appears attractive, but the beginnings of technologies involved appear difficult. Theoretically, it should be possible to conceive of the stream bed, wet field, mud terrace as a first step in this direction. Secondary steps, and evolutionary elements, in this line of evolution do not appear easily formulated.[39]

A motivation leading toward the evolution of terracing, to many contemporary students of agriculture, is the desire to prevent erosion. Though many historic agriculturists must have been so motivated, it would appear that concern over soil erosion was not a truly early concern. Soil erosion, and its prevention, becomes a concern only to peoples who have long occupied a given landscape, who become gradually aware of growing scarcity of agricultural lands, who must face the task of enlarging their agricultural productivity, or who must face the task of regaining productivity in a landscape suffering from soil

[38] Summers (1952): 73.

[39] The senior author has long been concerned with such a possible line of evolution, as a part of the separate problem of the development of rice as a wet field crop, but, despite considerable field experience in the Orient, has not put in sufficient comparative field work on either subject to come to satisfactory conclusions. Today rice is grown in natural marshes, but seldom do such areas show development of the elements of water control, and seldom are modern marsh rice growers also terracers. Modern terrace systems, and dike systems, have obliterated most of the landscape modifications executed by the earliest wet rice cultivators. The development of rice as a dry or a wet crop is a thorny problem. There does seem an hiatus in our sequence: natural wet marsh; stream bed, wet field, mud terrace; dry-wall, stone bunded, wet field terrace; sod covered, mud bunded, wet field terrace, if one presumes the wet field terrace to be an eastern Asian independent invention. It is our present judgement that the natural wet marsh did not constitute the starting point for wet field terracing, and that the 'disconformity' in evolutionary sequence is present because the whole concept of terracing came into eastern Asia from outside, affording early rice growers a markedly new approach to the whole problem of growing wet field rice.

erosion. In other words, the concern over soil erosion is a late development, and could hardly have been present in sufficient degree to account for the beginnings of terracing in the remote past.

Still another motivation possibly productive of terracing is the desire to apply water to fields that are too dry to produce crops adequately through natural precipitation or penetration of ground water. Here we approach situations in which early man, and later simpler cultures, have actually worked. It is a commonplace among anthropologists that some non-agricultural peoples do lead water to wild plant growth, out of a desire to increase the yield of edible products.[40] No real technology is required, and a simple stick can line a miniature channel along which water can flow. Early man must have done such things repeatedly and in many parts of the seasonally dry world. Among very early cultivators who tried to grow crops in the dry parts of the world there is another extremely old procedure in this line of motivation. It is the planting of sites seasonally soaked by natural flowing water, which appears to us a possible starting point for the evolution of terracing in general. In the flatter areas of the arid Middle East and North Africa irregular to periodic flash floods, known as *seil,* descend from the surrounding uplands, deeply soaking surfaces and coating them with silt. Thus an ancient tradition of crop growing in these areas, still practised, involves planting in the moist silt cover after the water has soaked away. In areas of small streams a simple check dam may be built across a stream channel to localise the coverage of water and the accumulation of silt. Bowen has commented on the above practice, stating:

> 'It is very easy to see how primitive man could logically make the next step in the development of *seil* irrigation. He put a simple earth dam across a small wadi to trap a *seil* and its silt. When the silt dried up he planted his crop . . . Perhaps much of the development after man first dammed his small wadi was accidental or a result of the original growth of his initial invention. Assuming that the wadi was small enough so that he was able to build a dam which would hold all of the *seil*, it would not be long before the area behind the dam was silted up to such an extent that the *seil* would now be above the banks of the original wadi.'

Bowen was not working with a region of terraces, and was not concerned with true terraces, but what he describes is a method of producing an artificial, flattened, field surface created by an artificial embankment that essentially is a terrace.[41] Variations in the general procedure

[40] Forde (1934): 35.

[41] Bowen (1958): 86. For a discussion of floodwater farming in the American Southwest, see Bryan (1941), particularly pp. 224-6, and the literature on the subject cited by Bryan and for a modern application of the basic principle see Bennett (1960): 60, describing how the diking of lands adjacent to intermittent, debris-filled streams is currently producing a new version of a simple terrace type.

of handling naturally flowing water still occur in parts of the Middle East, some of them currently producing effects similar to that referred to by Bowen.[42] Bowen's volume is concerned with just such effects in southern Arabia at an early date.

Before carrying the thesis forward, other possibilities leading to flattening of slopes, on which planting could occur later, must be mentioned, though some of them are not, in themselves, motivations toward the flatter cropping field. The varied simple procedures mentioned in discussing the definition of the terrace, above, need not be repeated here to include them in the possible origins. There are other operations, however, that should be mentioned. Early housing operations probably led to flattenings of slopes in many parts of the world, and associated are the flat spaces created for threshing floors, dance floors, ritual grounds, and others of this sort. The disposal of refuse among simple cultures is perfunctory, and as refuse heaps gathered around housing sites, these might have become planting sites at a later period, possibly better production resulting from the accumulated refuse. The dooryard gardens of many simpler cultures, sometimes remaining on sites abandoned for residence, afford another variation. Such accidental terracing of planting sites, however, requires some inspirational dynamics to carry it forward in purposeful evolutionary patterns.

The natural flattening of slopes, produced in nature in numerous ways, is still another possible source of terracing. Such features as stream benches, natural levees, seasonal overflow zones with their soft, moist silts, and many related conditions, long have been used as cropping sites.[43] However few artificial terraces appear to reproduce these patterns, and the sequence of evolutionary stages does not appear readily.

One last variety of development suggests itself. In several parts of northwestern Europe the strip lynchet displays many terrace-like elements, even when there is no evidence present such as the stone dry-wall embankment. We have not tried to explore the strip-lynchet literature, but it is evident that if not true terracing, the strip lynchet at least represents a relative of terracing. Probably related to early plough culture, in which the long narrow field would have been purposeful, the strip lynchet may well be a plowman's contour terrace long predating the modern machine contour terracing. The ploughman's art long has made possible the gradual net movement of earth in one direction, and the production of earth-filled breaks-in-slope through the use of the plough alone is possible by ploughing predominantly in one direction on a given surface. Since northwestern

[42] Burckhardt (1822): 348-50; Bowen (1958): 68-70.
[43] Swanson (1955): 125-6.

Europe is a humid area with turf-forming short grasses, early farmers here might have either purposefully or accidentally produced terrace effects in which the grass turf prevents erosion,[44] as in the Asiatic wet-field bund.[45] The strip lynchet, as such, could only be a late addition to terracing technology, and could not have been an origin of terracing in general.[46] It is doubtful if the earliest ploughing, in the Middle East, used the kinds of lands needing terracing, so that ploughing there would probably not have been terrace-originating.

Of the varying procedures available to early man, involving simple techniques and skills only, but with potentially evolutionary elements clearly relatable to growing numbers of people, growing power, and growing technology, it would appear to us that at least one sound evolutionary sequence of terracing can begin with *seil* irrigation. The first terraces would be little more than incipient true teraces, but the very method of producing them could, with little engineering ability, produce many of them around the margins of a given drainage basin, and could set the stage for the application of primitive technology in a purposeful way.

If a people were to conceive the dynamics of such an application and attempt it on a very small channel producing only a small flow and a small volume of silt, by working close to the mouth of the narrow channel they might have succeeded in creating a small area of fill more properly labelled a terrace than would be true for the broader, larger area lower down on a flat basin floor. If such an attempt succeeded, later flood flow would tend to be diverted to one side, off the crown of the fill. Further barricading at the margins could add to the height of the fill. Begun on a very small scale, suffering washouts, undergoing experiments, and achieving final success, a true terrace and its production technology could have resulted. Throughout the arid portions of the Middle East very simple terrace-like structures are to be found near hill margins, on the upper flats, which appear to represent the transition between a *seil*-entrapment basin and the true terrace. Having but little careful descriptive data on such structures we have not specified this as a terrace type, but some transition form must have existed between the trapping of a *seil* in a wadi and the narrow channel, barrage terrace. Louis E. Guzman, who has studied terracing

[44] Crawford (1923): 356, quoting Seebohm, *Village Community* on the role of the plough and the unploughed balks between fields in the formation of strip lynchets.

[45] Curwen (1932): 400. That in France the grass and turf is burned along the edge of an incipient break in slope, to prevent the terrace effect growing larger, is an interesting point of some significance.

[46] Pfeiffer (1956): 251, comments on the terrace-building effect of contour ploughing as dating back to the Bronze Age of Central Europe. See also Wood (1956): 12-16.

in southern Mexico, suggests that below the foothill margins of open lowlands there is evidence of a local approximation to the Old World *seil* irrigation, and that there are terrace forms closely approximating channel bottom, weir terracing and narrow channel, barrage terracing, as well as the higher forms of dry field and irrigable dry field terracing. He suggests that there appear, in small terraces now abandoned and dissected, evidence of very old low terraces, covered by younger and higher terraces produced by a second barricade. In some cases the two barricades are aligned in similar direction, but in other cases the second barricade appears set at a different angle, though directly across the later line of flow. These are rather small features, built across small drainage channels rather than across stream channels potentially having large volumes of flood water and silt. Such elementary terrace forms would appear to approximate those we suggest for the Old World. [47]

The narrow channel, barrage terrace as built by the Judeans in the Negev, is perhaps not the next literal step forward, but is several steps up the evolutionary ladder. However, it is a true terrace, in every sense of the word, and adds only dry-wall stone engineering as a technologic additive to make it operative. Once true terracing had begun, the human capacity for adapting a pattern to a local environment could well have substituted different specific aims and purposes which could have carried forward the evolution of terracing as a whole. We would by no means insist that all terracing owes its origins to *seil* irrigation, nor to a single evolutionary origin. It is rather that it dies not now seem possible to outline other specific evolutionary sequences. Critical field examination of terracing in different parts of the world may well produce other situations contributory to additional origins and evolutionary sequences.

THE GEOGRAPHICAL ORIGINS AND DISTRIBUTIONS OF TERRACING TECHNOLOGIES

It is a kind of historical commonplace to associate terracing with China, with the Mediterranean Basin and the Near East, with the Andes, and with certain other portions of the earth. This association sometimes is related to the very origins of agriculture; for example, there have been inferences that terracing and agriculture were prac-

[47] Guzman (1961): in press. An abstract, Guzman (1958): 266, contains the sentence: 'Silt-laden water was halted behind walls, permitting suspended material to settle, and creating fertile land, capable of sustained cultivation,' which indicates some phase of controlled sedimentation, though the wording is too abbreviated to define the stage of terrace development involved.

tically synonymous in China from the beginning.[48] There is little certainty, so far, in the place of origin of terracing in the first instance. There is some evidence to argue that terracing may well be of multiple origin, but it is very questionable if all the regional expressions of terracing are expressive of local origins. Rather it would appear that the basic concepts of terracing owe their origins to a relatively few regional developments, and that early concepts and technologies of terracing spread by diffusion to many of the parts of the world in which today the traditional systems of terracing are to be found. But the very multiplicity of aims for terracing, and types of terracing, suggests that secondary invention and evolution has produced widely scattered specific origins for different kinds of terrace systems.

It appears plausible, also, to suggest that the traditional styles of terracing for different specific purposes reached evolutionary and constructional maximums many centuries ago in different parts of the world.[49] It follows that certain traditions of terracing were maintained at certain technological levels by historical successions of application in equivalent situations, but it follows, equally, that in some parts of the world terracing technology has been a recessionary tradition, with many modern peoples knowing only rather simple portions of one of the terracing systems. Very evident is the fact that many current populations carry on agricultural cropping on terraced landscapes which they did not build, which they do not extend in the traditional manner, landscapes whose technological development they cannot match.

In the near-modern and modern period there are many variations in the matter of terrace building and utilisation, though in general it can be stated that the traditional terracing systems are being little expanded in today's world of high labour costs and alternative technologies. In several areas old terrace lands lie abandoned and uncultivated. Areas of old terracing today are in forest, or are in parkland used only for grazing and wood-product extraction.[50] Shifting cultivators operate over terraced landscapes obviously built for some form of sedentary cropping system. Repeatedly there has been contraction and expansion of cultivation on agricultural lands initially turned into ter-

[48] King (1911), Buxton (1929), and Granet (1930) all associate terracing with agriculture in earliest China. However, critical examination of early Chinese classics by numerous scholars has produced no reference to terracing as such; all references are to major works such as flood control, canalisation, and irrigation of flat lands. See Creel (1937A), Creel (1937B), Needham (1954), and Wittfogel (1957).

[49] Beyer (1955): 396, suggests that the maximum development of the North Luzon terraces occurred, roughly, between 500 A.D. and 1000 A.D., and that their total area has been declining.

[50] Personal observation by the junior author in some portions of Lebanon.

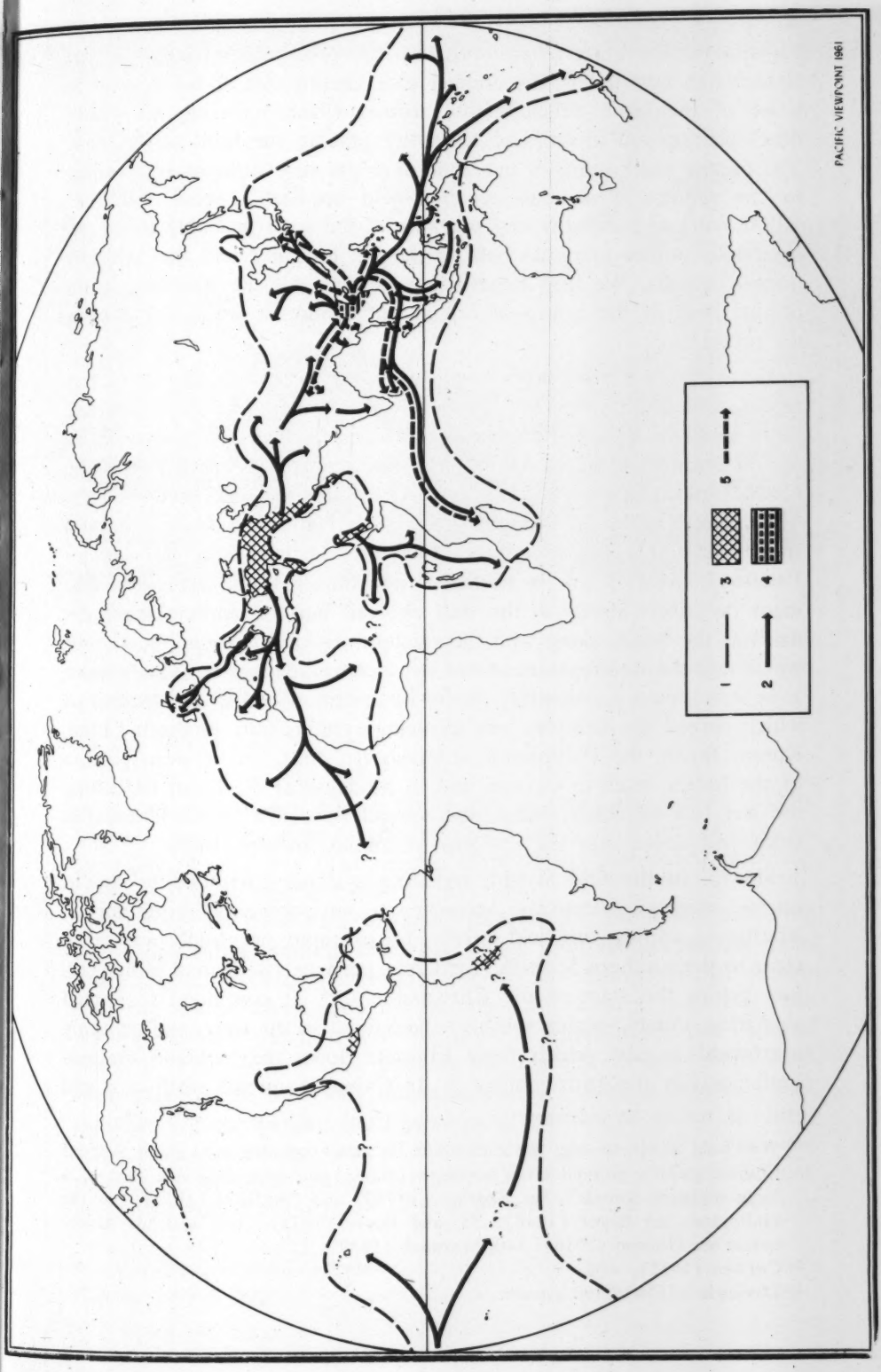
raced landscapes long ago. There is the rehabilitation of old terracing, using equivalent technologies. There is some localised new terracing in the traditional manner, filling in sections of landscapes over which the terraces never fully spread. There is removal of ancient terracing and the rebuilding of new terraces along traditional lines, employing excellent or better stone-working technologies. [51] Since we are concerned largely with traditional terracing such issues affect, to a small degree, the issue of origins of terracing types and, to a larger degree, the present distribution of traditional terracing.

The accompanying map presents tentative conclusions as to the places or origin, the routes of diffusion, the centres of secondary development, and the distribution of the traditional systems of terracing. The distribution of terracing is suggested in terms of the widest known locations, but the outer limit perhaps should be extended still further. There is no suggestion that all agricultural lands within these limits ever were terraced, and no suggestion that terracing became an integral element in every agricultural system employed by peoples who occupy the diverse regions within the outer limit of terrace distribution. [52] We stress the point that this map is highly speculative, but it does seem to answer many of the questions related to terracing systems. The basic suggestion is that the initial developments in terracing took place in any of several roughly equivalent landscape situations in the classical Near East. Reference is not to the lowlands of the great river valleys, but to the then semi-arid to arid foothill margins possessing small, intermittent streams debouching upon flat lowlands. Geographical reference is to situations located between the

[51] This process is going on today in Lebanon, with the rebuilt and new terraces being devoted to deciduous fruits, especially apples, for the export market. See Lewis (1953): 7-11.

[52] For example, though the Philippines is shown completely within the zone in which terracing was employed, the traditions of fine terracing never were used by all Filipinos, they became recessional traditions long ago, and are preserved only by the North Luzon mountain peoples. Elsewhere in the Philippines there is little terracing to be seen, much of what has been done outside North Luzon is rather elementary, and seldom has it employed water control as an efficient and integral element of terracing. The Filipino use of water in growing lowland 'wet field' rice is both elementary and incomplete in most parts of the islands. Similarly, in Great Britain, there is but little true terracing, and the tradition of terracing ceased long ago. Even the creation of strip lynchets long ago ceased to be part of the development of agricultural landscapes.

Fig. 5. Origins and Dispersal of Agricultural Terracing. 1. Outer limit of agricultural terracing 2. Dispersal of earliest terracing technologies 3. Region of origin of earliest terracing technologies 4. Region of origin of wet field terracing 5. Dispersal of wet field terracing.


PACIFIC VIEWPOINT 1961
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Arabian Sea, the Aegean-Black Seas, the Caucasus, and the Zagros Mountains. The eastern limit possibly could be placed as far east as Baluchistan but, so far, the archaeological record east of the Zagros, in some of the basic developments around which terracing may have developed, is too incomplete to justify placing the limit so far east. The precise outer limits of our zone of origin vary somewhat according to the pattern of rainfall regimes held applicable some 9,000 to 5,000 years ago, but the key portions of the zone probably lie in the drier hill country marginal both to the flat lowlands and the naturally humid uplands. We lean toward a preference for the northern sector of this zone as the centre of origin, but cannot at present document the preference.

From this zone the several varying concepts and traditions of terracing spread out over the ancient world, undergoing evolution and tailoring to local ecologic environments and to types of landscapes as the diffusion took place. At an early date this spread encompassed the Mediterranean Basin, northeastern Africa, the eastern sector of the Middle East, penetrated eastward along the Himalayan front to coastal Indochina and, quite selectively, deep into the islands of the western Pacific. It possibly was in northern Indochina that the stone embankment described above as the wall evolved into the embankment defined as the bund, along with the reinterpretation of the application of water into the development of the wet rice terrace system. This eastern zone constituted a secondary centre of invention and evolution, out of which spread the complex wet terracing systems into southern China, Korea, Japan, the Philippines, southeastern Asia, the western portion of the Indies, back to Ceylon, and to Madagascar. [53] From Indochina the wet rice terracing system also spread westward to the Himalayan front and down into the margins of humid lowland India.

Slowly, in the Old World, terracing systems continued to spread on the margins, selectively, according to environmental requirements, The linear sloping, dry field terrace, for example, eventually was taken clear to the southern Scottish Highlands, perhaps via Roman influences, just before the start of the Christian era. [54] It continued to spread in Africa, slowly, getting south of the Sahara in the west, and creeping southward in east Africa from Ethiopia down the highland margins until possibly the 16th century. [55] In China, it spread northward and

[53] Wet field rice growing, as a complex, is now considered to be a part of Chinese culture derived from southern origins, and is merely one part of a large southern complex. See Eberhard (1950) and Needham (1954). For the Philippines see Beyer (1948): 55, and Beyer (1955): 397, and for Madagascar see Gourou (1956): 340, Murdoch (1959): 217.

[54] Curwen (1932): 404.

[55] Davidson (1959): 192 *passim*.

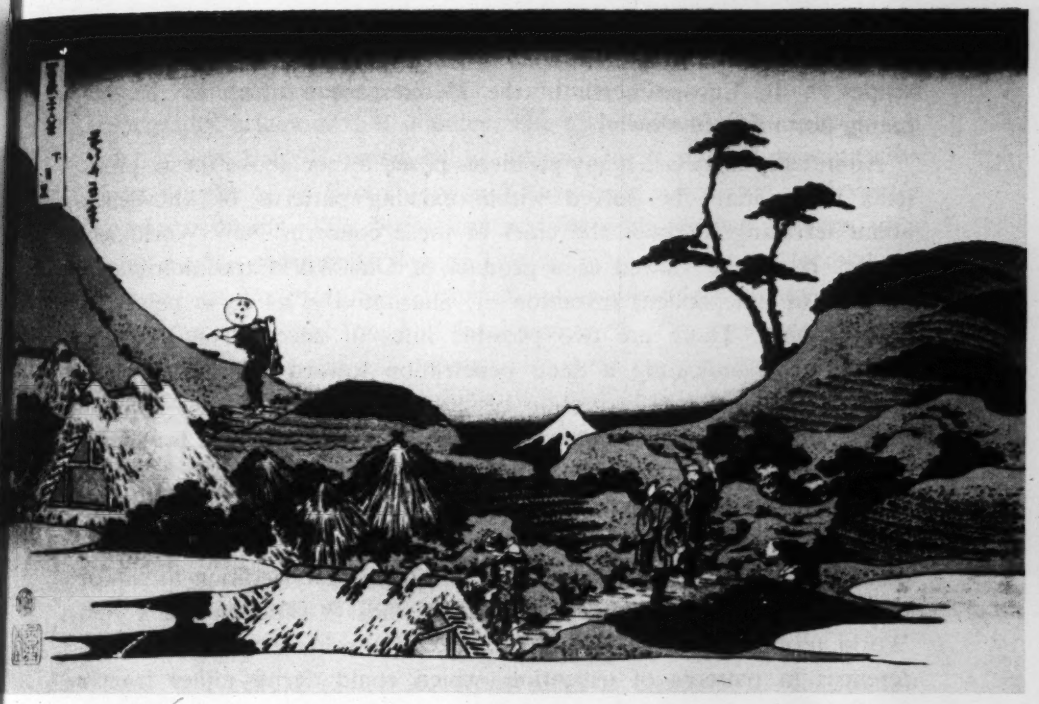

Fig. 6 An artist's impression of terracing in southern Honshu in the early nineteenth century: the hillocks of Lower Meguro terraced for vegetable growing, (one of the "Thirty-Six Views of Fuji", by Hokusai).

out into the northwest China. Other terrace types also spread, locally adapted, slowly or more rapidly in varied areas. In Korea and Japan, for example, the wet field terrace crept slowly northward, reaching northern Honshu only in the 17th century.

Much of the traditional terracing patterns we see today converted landscapes rather continuously, but many such landscapes are relatively recent. In China there were several eras of rapid terrace expansion, the last of which probably was the 18th century; there has been remarkable little wet field terracing done in China in the last hundred years. [56] The north Luzon terraces are thought to have been built over a period of over two thousand years, [57] and in Japan it took centuries for the present local patterns of terraces to elaborate themselves, whereas a large share of the terracing of the island of Java is a product of the 19th century. Though the wet terrace system became associated with Ceylon at an early date, much of the present wet rice

[56] See comment at footnote 2 above.
[57] Beyer (1955): 395-6.

terracing of peninsular India is 18th and 19th century development of lands formerly the realm of the shifting cultivator of sloping landscapes.[58] In Europe north of the Mediterranean much of the terracing accumulated slowly.

Admittedly there are many problems posed by the above thesis, problems that cannot be solved within existing patterns of knowledge about terracing. Perhaps the chief of these concerns New World terracing. It can be viewed as a product of Old World traditions, as a product of independent invention or, alternatively, as some combination of both. There are two possible lines of access from the Old World, each indicating a deep penetration toward the New World. One is the westward projection of dry field, wall terracing into the islands off the African coast, and the second is the eastward projection of the same tradition deep into the Pacific. However, there also are environmental situations along the Peruvian coast and in southern Mexico similar to those of the semi-arid to arid Near East, and it is possible to suggest the parallel invention of similar tradition in similar environments by peoples seeking similar ends.[59] Though much New World terracing resembles that of the Old World, there also are differences in patterns of execution, which could derive either from a totally different tradition, or from a separate path taken as evolution and maturation in terracing technologies came about. We take no position in the matter of the origin of New World terracing, since few critical studies of terracing technologies have been carried out for either hemisphere.[60]

Looking back to the general region in which we suggest the origin of Old World terracing, it is evident that not all terrace types could have had their specific origins in the same local environment. The channel bottom, weir terrace belongs to the flat lowland side of the

[58] The use and distribution of full scale wet field terracing in India south of the Himalayan front, historically, needs close examination. It is our present judgement that India has made far less use of true wet field terracing than frequently is surmised from the importance of rice as a crop. The series of irrigable fields often found along a stream valley below a tank is very old, but these often do not comprise full, true terracing.

[59] See footnote [47] above. If clearly evolutionary sequences of terracing can be documented effectively for any portion of Meso-America, the whole complex of problems around New World terracing would be altered, and there would be a sound base for considering the independent development of New World terracing.

[60] There is too great a volume of emotion clouding the issues of Old World pre-Columbian contact with the New World, and too little objective examination of critical cultural data, in addition to too little comparative study of terracing, to permit a conclusion at present.

foothill margins, whereas the narrow channel, barrage terrace belongs to the hill country itself, though both belong to country too dry for certain kinds of cropping systems. The linear sloping, dry field terrace belongs, by origin, to hill country, but to hill country having enough precipitation that cropping could depend upon natural precipitation alone. In the Near East this would have been associated with winter cropping systems. The linear contour, irrigable terrace belongs to a region having perennially flowing streams, and would seem to relate to local regions far more humid than those in which the channel bottom weir terrace was the normal development.[61] The tree-crop buttress terrace belongs to the hill country also, and perhaps its development is more expressive of conditions of relief than of rainfall regime, though it certainly is not a feature of desert environments. The last four terrace types all are associated with quite humid regions, and they could not have derived their origination from any portion of the Middle East. The last terrace form, if it does belong in terracing at all, does relate to an environmental situation in which dryness of the top soils required compensation, but taro is by nature a humid environment plant to begin with.[62]

The very nature of terrace types suggests elements of distribution preference to peoples taking up terracing as a method of furthering the development of cropping systems and agricultural landscapes. As terracing spread north of the Mediterranean fringe into the humid landscapes of northern Europe, the linear sloping, dry field terrace provided the type of field necessary under the rainfall regime and season of cropping. As wet rice has spread out of the Orient the wet field terrace was utilised. Within the Orient as wet rice has spread sloping dry field terraces have been converted into wet field terraces. As peoples have, in the past, upgraded their agricultural systems, terracing systems have altered as a complement of the agricultural system.

In a somewhat speculative article of this sort, not all of the assertions can be soundly documented. Though considerable field inspec-

[61] The highlands of the Levant and of Yemen are today regions of fairly intensive utilisation of the linear, contour irrigable terrace. Local environmental conditions in these two areas would have been favourable for the development of this kind of terrace.

[62] Obviously we have not fully explored the literature, nor does either author have personal field experience in areas in which the taro pit-field occurs. The relationship of the older form of the taro pit-field to the present taro fields located in wet spots, and to the elementary terracing of taro fields in the modern period is not well discussed in this article. There are evolutionary and sequential problems around terracing in the Pacific not brought out in our discussion.

tion of terracing lies behind the suggestions made, the suggestions put forward are highly tentative, for neither author has spent field periods specifically testing the general thesis. Though much of the regional literature has been perused, it has only been sampled, for the kind of critical study of terracing needed has never been done. It is the hope of both authors to further pursue the subject, but the subject is one that requires the critical examination of many landscapes throughout the earth for the evidence of one of man's significant forms of imprint upon the physical environment.

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Population, Land Utilisation and Possible Expansion of Cultivated Area in Nepal

PRADYUMNA P. KARAN and WILLIAM M. JENKINS, Jr.

In Nepal, as in most of monsoon Asia, population pressure on land is intense. Here, problems of land use and land tenure are of paramount importance, permeating almost every phase of the nation's economic and social life. Despite rugged terrain and relatively unproductive soils, Nepal has an average population density of over 153 persons per square mile. [1] The density per square mile of cultivated area is more than 1,300. The present population of 8,500,000 is increasing at an estimated rate of two per cent annually. As population pressure on land increases, finer adjustments must be encouraged between land use and potential productivity of the land if even the present low standard of living is to be maintained. Basic to an approach toward solving the complex agro-economic problems of Nepal is the land use inventory. There is little trustworthy data concerning the proportion of Nepal's land utilised for crops, the amount of land devoted to grazing and forests, or the exact extent of the waste and barren areas. Were this essential information collected and mapped, the planning of agricultural development in Nepal would be greatly facilitated. [2] It would also enable planners to assess more accurately the possibility of increasing the area under agriculture in order to augment the present food supply for the rapidly growing population. The distribution of land in Nepal among agricultural, grazing and forestry, and waste and barren areas and the factors which have led to this pattern are, therefore, of common concern to geographers, economists and planners. Hence some of the results of a land use inventory of Nepal such as that presented here may be a worth-while addition to the limited source material necessary for economic planning in Nepal. [3]

[1] Kumin (1958).
[2] Stamp (1958): 15; Stamp (1960).
[3] Karan (1960): 97-100.

P. P. Karan is Associate Professor of Geography, University of Kentucky.

W. M. Jenkins, Jr., formerly co-ordinator of the U.S. technical aid programme to Indonesia, is now Associate Professor of Political Science, Western Kentucky State College.

LAND UTILISATION

During 1957 a general land use survey was carried out in Nepal with light aircraft and a 35 mm. camera. The aero-field technique employed in this land use inventory of Nepal is described in the appendix following this paper. The land use mapping formed part of a comprehensive regional survey undertaken by the senior writer, sponsored by The Population Council, Inc., of New York and the American Philosophical Society of Philadelphia. Throughout the survey emphasis was placed on the predominant use to which the land was put. Although the pattern which emerges is considerably generalized, the map gives an accurate impression of both the amount and relative proportion of land put to different uses throughout Nepal.

Cultivated Land

The land use map (Fig. 4) reveals four major concentrations of cultivated land: (a) the sub-tropical eastern *terai;* (b) the mid-western *terai* (Figs. 3 and 5); (c) the central hill farming region extending from Katmandu Valley to Pokhara Valley; and (d) the eastern hill farming region. Widely scattered patches of cultivated land also occur in the mountain valleys of western Nepal, in the warm dry far-western *terai,* and elsewhere, but these are unimportant as compared with the four major concentrations of cultivated land noted above.

Clear delineation of Nepal's agricultural regions would seem to be a starting point for an analysis of the cultivated land. The air photos and the resulting land use map, by permitting direct observation of spacing and intensity of cultivated land, served as a basis for mapping the agricultural regions (Fig. 5). These regions were identified by drawing lines around the areas (on the land use map, (Fig. 4) having distinctive land use and farming characteristics. This categorization of agriculture is admittedly somewhat arbitrary, yet considerable air reconnaissance and mapping by the senior author in 1957 contributed to the establishment of boundaries.

The eastern *terai,* falling within the districts of Parsa, Bara, Rautahat, Sarlahi, Mahotari, Saptari and Morang, is the outstanding agricultural region of Nepal.[4] This area, which forms the northernmost extension of the Gangetic plains of Bihar (India), varies in width from 16 to 20 miles and consists mainly of alluvium which is rather gravelly in the north. This hot and humid area (Fig. 2) has an annual rainfall of more than 80 inches and is the environment of nature's dense forest and man's rice, jute and sugar cane. An extended monsoon and heavy rainfall permits the cultivation of two or three crops per year. The chief crops are those which require much water,

[4] This conclusion arrived at by the plotting of land use is substantiated by Rauch in a flight over Nepal. Rauch (1953): 317.

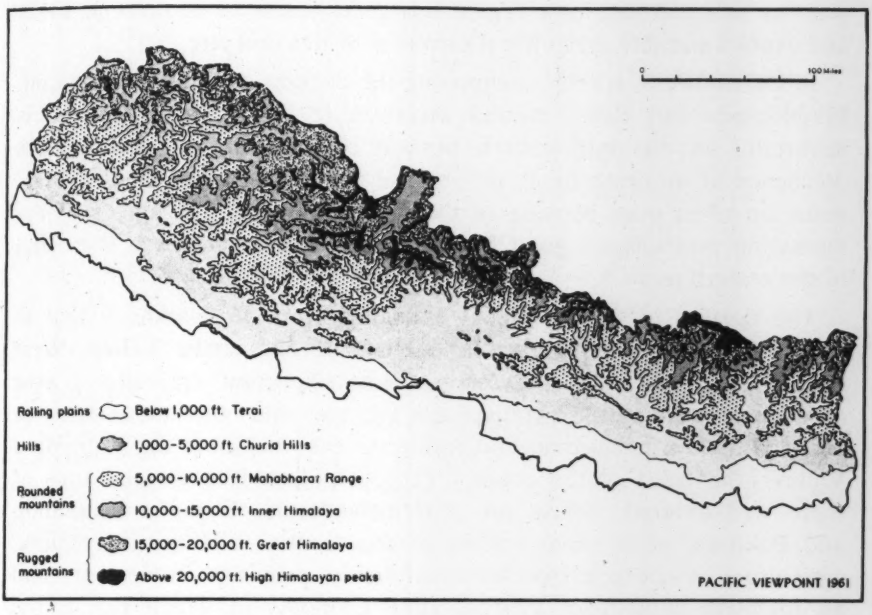


Fig. 1. Relief. Based on Survey of India, 1 inch to 4 miles map sheets.

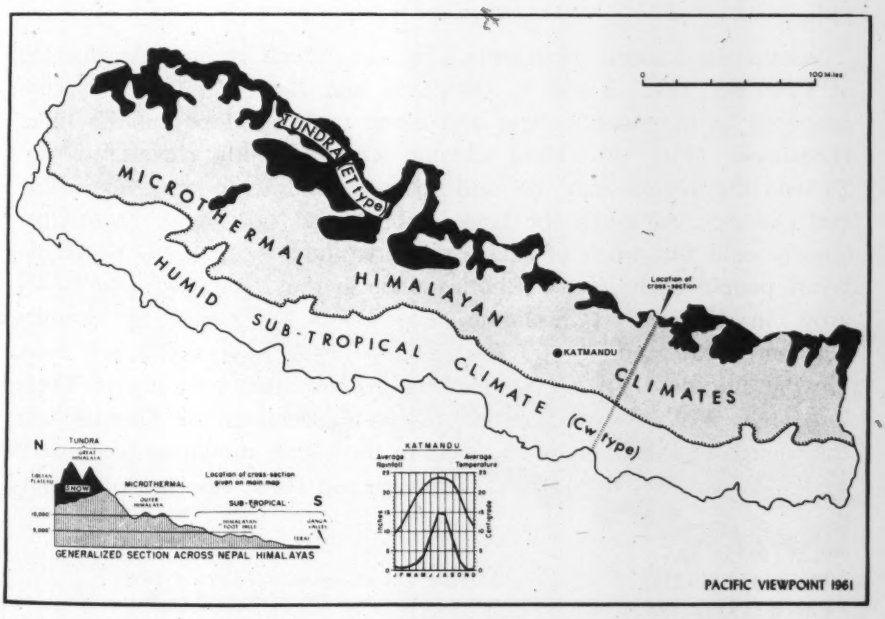


Fig. 2. Climatic regions based on vegetation. Generalised map based on field reconnaissance. Rainfall and temperature graph of Katmandu based on official data.

such as rice and jute. The region has good access to markets in India and exports sizeable agricultural surpluses of rice and jute. [5]

In the midwestern *terai,* comprising the districts of Siuraj, Khajahani, Majhkhanda and Palhi, rainfall decreases to about 40 inches and is uncertain. In this mid-western portion of the *terai* the comparative deficiency of moisture limits the intense use of cultivated lands. [6] Harvests are often poor because of the lack of rainfall. The soils and the marketing position are good but cultivation is less intensive than that of the eastern *terai.*

The portion of central Nepal extending from Katmandu Valley to Pokhara Valley, comprising the districts of Katmandu Valley, West No. 1, 2, 3 and 4 is the second most important agricultural area of Nepal. [7] Here the Mahabharat Range and the mountains of Inner Himalaya enclose several fertile valleys, including the Katmandu Valley—the heart of the country (Fig. 3). The deep alluvial soils of these well-watered valleys are extremely fertile. Both in Katmandu and Pokhara, as in other valleys of this 'central hill farming region,' agriculture is characterized by small fields, primitive implements and an intensive subsistence type of rural economy in which rice is the leading crop (Fig. 8). The hill slopes are carefully terraced. Cultivated plots in the valley bottoms are indeed small, but those on the extremely steep slopes are narrow and smaller (Fig. 10). In this densely populated part of Nepal (Fig. 6) land use is highly intensive (Fig. 4).

Within the eastern mountains (Fig. 3), which include the districts of East No. 1, 2, 3 and 4, Dhankuta and Ilam, agriculture is concentrated in mountain valleys and along terraced slopes of the Inner Himalayas (Fig. 3). Here climate changes with elevation (Fig. 2) and the region may be said to have undifferentiated microthermal climates. Although the land is rough and stony and the weather bitterly cold for much of the year, agriculture is practised by Himalayan people such as the Bhotias and Sherpas. Potatoes and barley grow in Khumu [8] (Chisankhu, East No. 3) mostly at altitudes between 8,000 and 10,000 feet; potatoes, the Sherpas' largest crop, grow at altitudes up to 14,000 feet [9] and occasionally even higher. There is a great deal of transhumance, for in the summer the Sherpas take their herds of sheep, goats and yaks to the higher mountain pastures. [10] In the lower parts the Limbus, Sunwars and Rais, who are predomin-

[5] Pant (1955): 88.
[6] Theuvenet (1953).
[7] Rauch (1953): 318.
[8] Stonor (1955): 170.
[9] Weir (1956): 103.
[10] Maillart (1955): 15.

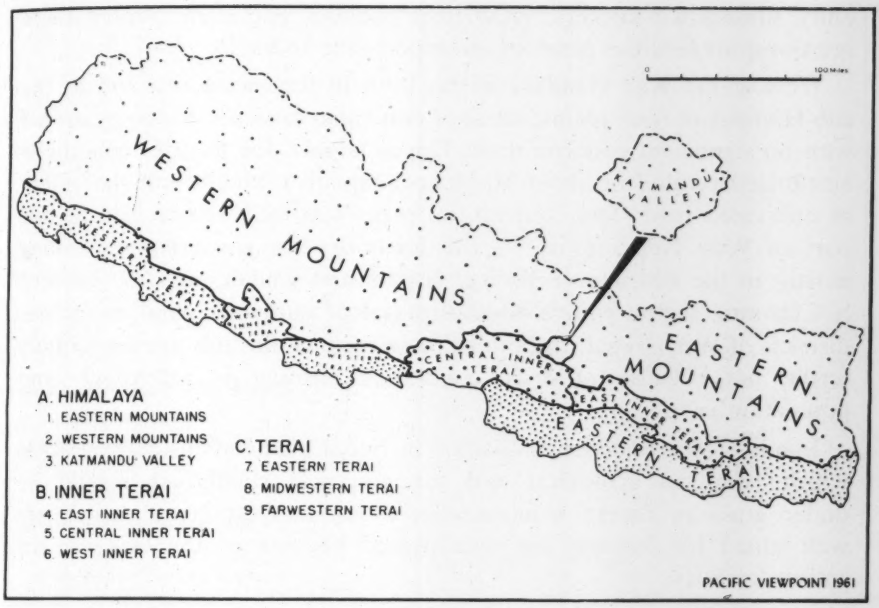


Fig. 3. Geographic regions. The regions are based on the total physical and cultural geographic expression of landscape complex. To facilitate the use of official statistics, existing district boundaries, although arbitrary in some places, have been used in delimiting one region from the other.

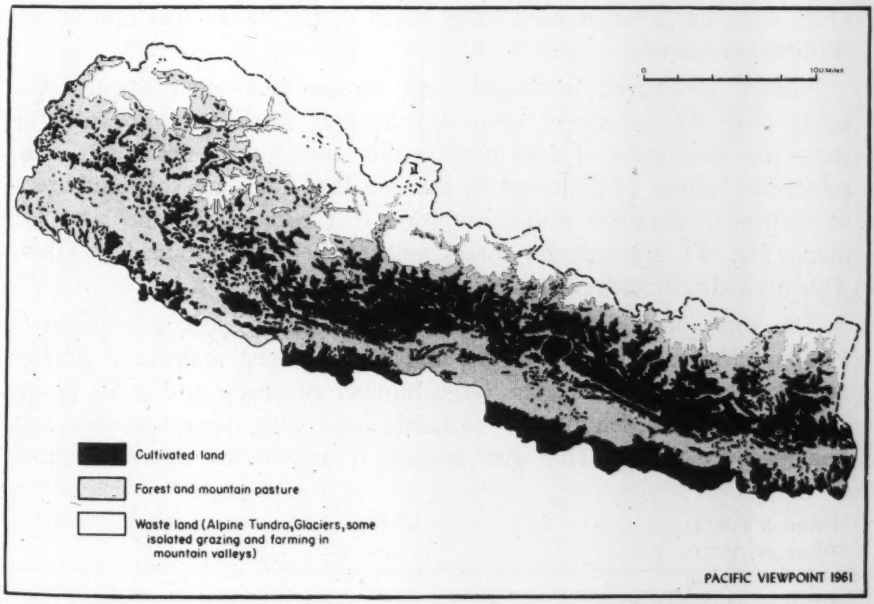

Cultivated land
Forest and mountain pasture
Waste land (Alpine Tundra, Glaciers, some isolated grazing and farming in mountain valleys)
PACIFIC VIEWPOINT 1961

Fig. 4. Land use pattern. Map compiled from air photographs.

antly subsistence farmers, grow rice, potatoes and corn. Where there are transport facilities potatoes are exported to India. [11]

West of the Kali Gandaki River, both in the mountains and in the sub-Himalayan *terai* plains, areas of cultivated land are widely scattered with no significant concentration. This is largely due to drier conditions (estimated rainfall of about 30 inches annually) which limit the extent of cultivated land. Two agricultural areas may be distinguished in this part of West Nepal (Fig. 5) the warm-dry far western *terai* falling mostly in the districts of Banke, Bardia and Kailali, and the western hill farming region with a wide dispersal of cultivated land in various districts of West Nepal. In both of these regions the soils are moderately fertile, but because of drier conditions farming is extensive[12] and population is sparse.

Lands presently under cultivation in Nepal include considerable areas which from an ecological and topographical standpoint should be under grass or forest. Contrariwise, areas in West Nepal which are well suited for farming are uncultivated because of the lack of irrigation facilities.

Grazing, Forest and Wasteland

Most of the forests [13] of Nepal are located in the foothills and the Inner Himalayan ranges (Fig. 3). In the *terai* plains proper, especially in the eastern and midwestern *terai* (Fig 3), areas under forest are comparatively small. In western Nepal more land is in forest, but much of it is unproductive because of over-felling or overgrazing (Fig. 11). Large areas have been burnt in the destructive practice of shifting agriculture.

Pasture is limited in Nepal, and forests and other uncultivated lands (Fig. 4) are closely grazed, [14] making it all but impossible to show the two forms of land use (grazing and forest) separately .The pattern is further complicated by the fact that there are scattered areas of shifting cultivation within the forests. Therefore, on the land use map (Fig. 4) grazing and forest lands have been grouped together. This area also includes strips of cultivated land.

The total pasture is insufficient for the large cattle population. [15] Fodder crops are seldom grown and cattle subsist mainly on pasture and the leaves of trees. The large number of sheep and goats places an additional burden on the available land with the result that it is heavily over-grazed. This over-grazing is one of the main causes of

[11] Rauch (1954).
[12] Rauch (1953): 319.
[13] Robbe (1954).
[14] Kihara (1955): 319.
[15] Bowers (1953): 27.

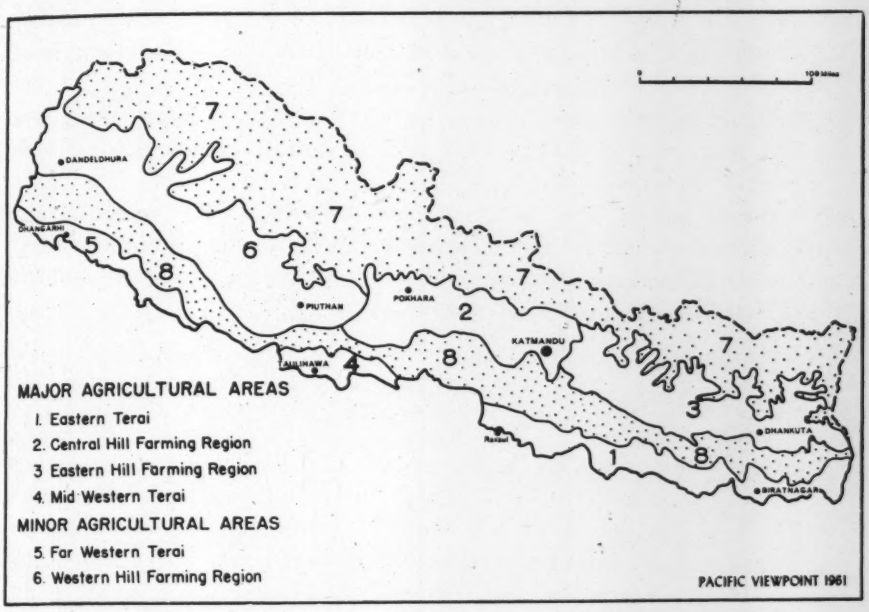


Fig. 5. Agricultural regions. Stipple indicates largely non-agricultural areas. 7. Himalayas, 8. Churia Hills.

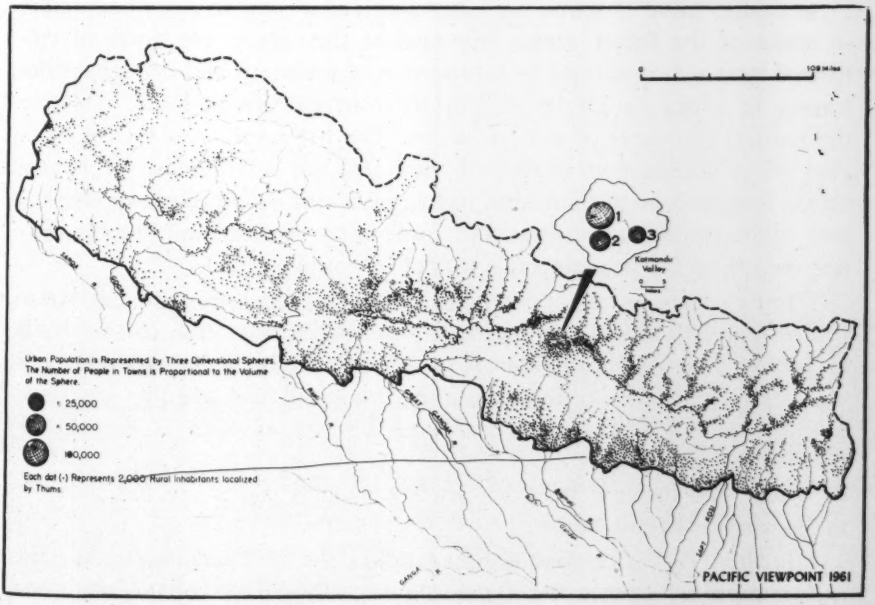

Katmandu Valley
Urban Population is Represented by Three Dimensional Spheres. The Number of People in Towns is Proportional to the Volume of the Sphere.
= 25,000
= 50,000
= 100,000
Each dot (·) Represents 2,000 Rural Inhabitants localized by Thums.
PACIFIC VIEWPOINT 1961

Fig. 6. Distribution of population. Based on official census data. Towns: 1, Katmandu. 2. Patan. 3. Bhatgaon.

the destruction of forest and of soil erosion in Nepal. The high Himalayan region contains good pasture, but owing to its topographical position its use for this purpose is limited.

Most of the wastelands (Fig. 4) lie in the Great Himalaya above 15,000 feet (Fig. 1). Here the climate is truly alpine tundra, with the rugged mountain ranges of the Great Himalaya rising into peaks of perpetual snow. It is practically uninhabited except for small and widely dispersed settlements in the lower parts of the mountain valleys at about 15,000 feet. Because of the rugged terrain and severe climate these lands are practically barren and useless.

POSSIBILITY OF INCREASING THE AREA UNDER CULTIVATION

At this point, when the main uses of land have been considered, it is possible to discuss the question of increasing the area under cultivation. The question is of considerable significance, as increasing the cultivated area is one of the major means (the other being increase in productivity per acre) of raising agricultural production to meet the needs of the growing population of Nepal. On this subject the writers of this paper have come to the following conclusions.

Firstly, the possibility of increasing areas under cultivation is exeremely limited in the wastelands of the Great Himalayan region because of the rugged terrain and severe climate.

Secondly, there is scope for extending cultivation to a limited extent in some of the forest areas. But against this, there are areas of cultivated land which should be retired from cultivation and brought under forests in order to afford protection from soil erosion and conserve the natural resources of soil and water. The net result would most probably be a decrease in cultivated area and not an increase. The area under forests is insufficient and has to be increased to improve physical and hydrographic conditions for controlling erosion and floods. Any decrease from the present totals cannot be contemplated.

Thirdly, there is an appreciable scope for expansion of cultivation in areas of fallow lands in the *terai*. Substantial reduction can be made in fallow lands if more intensive cropping methods are adopted and soils are fertilized, so that there is less need for keeping the land fallow. As a considerable portion of the fallow land is in the dry areas of western Nepal, extension of irrigation facilities and improvements in dry farming methods are other steps necessary for reducing the acreage of fallow lands.

Fourthly, there is scope for expanding the cultivated area by land reclamation projects in the marshy and swampy areas of the *terai*, and by large-scale irrigation projects in the dry areas of western Nepal. The precise figure of additional areas available for cultivation by such

Photo: P. P. Karan

Fig. 7. Intensive agriculture typical of the mountain valleys in Central Nepal. Contiguous cultivated fields (some of them flooded) cover most of this narrow east-west valley; woods on the mountain slopes at the top of the picture.

Fig. 8. Terraced agricultural land ten miles south of Katmandu. The west lower terraces are used for rice and the drier upper terraces grow corn.

Photo: P. P. Karan

reclamation and irrigation projects can be determined by detailed land capability surveys. But it is quite clear that the total, whatever it might be, cannot be more than a fraction of the area already under cultivation. It would be reasonable to conclude from this land use reconnaissance that the possibility of expanding the agricultural area is extremely limited in Nepal. Farmers in Nepal have pushed the limits of cultivation as far as they could with the technological means and resources at their command. If certain cultivable lands remain uncultivated, it is mainly because they suffer from serious defects like deficiency of moisture or prevalence of malaria which, though they can be corrected with modern techniques, could not be tackled with the limited resources and rather primitive techniques of the Nepalese farmer.

CONCLUSIONS

The general land use mapping of Nepal by aero-field technique indicates that increases in Nepalese agricultural production to meet the requirements of her expanding population have to come mainly through increased production (or higher yields) from the lands already under cultivation. Higher yields from the present cultivated land can come through measures like the development of irrigation, use of improved seeds, application of manures and fertilizers, proper crop rotation, control of pests and plant diseases, and the whole range of agricultural improvement practices. These measures for increasing agricultural production involve widespread instruction of the Nepalese farmers in the use of scientific techniques of agriculture and rural development.

Increase in agricultural production resulting from expanding the area under cultivation (for example, by reclamation of lands in *terai* drainage schemes) will be limited because the additional areas which can be brought under cultivation are comparatively small. The pressure of growing population in Nepal has operated to bring under use nearly all cultivable land, including steep hillsides. Small areas can be brought under cultivation by modern engineering techniques of land reclamation which are beyond the limited resources of the Nepalese.

APPENDIX

THE LAND USE SURVEY OF NEPAL

The general technique of land use mapping has been to make detailed on-the-ground field surveys to plot information on the use of land for agricultural or other purposes on large-scale maps or an air photograph base. [16] The land utilization survey of 24-Parganas [17] (Bengal), Puerto

[16] Davis (1954): 507-16.
[17] Chatterjee (1946).

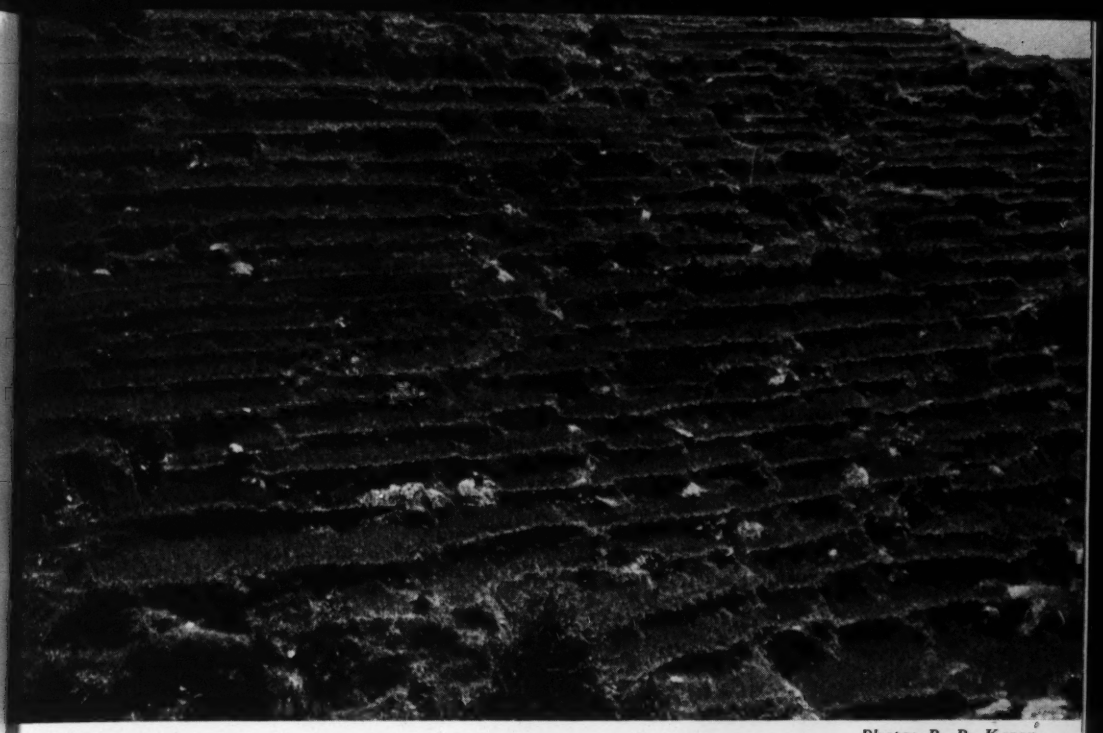


Photo: P. P. Karan

Fig. 9. Terraced fields on steep slopes are very small. These painstakingly terraced hill slopes reflect the pressure of population on available land. Near Gurkha in the central hill farming region.

Fig. 10. Dwarf peasant holding in Katmandu Valley; too small to utilize fully the labour potential of the household and inadequate for family maintenance.

Photo: P. P. Karan

Rico, [18] the Tennessee Valley, [19] and numerous land use studies of small areas in inter-tropical Asia and Africa [20] are examples of such land use mapping by ground survey methods. Land use can now be mapped directly from vertical air photos wherever available [21]. The recent land use survey of Cyprus [22] and parts of the Indus Valley in Pakistan [23] (with the technical aid of Canada under the Colombo Plan) are examples of direct land use mapping from vertical air photographs. However, in many parts of Asia and other underdeveloped areas of the world such aerial photographs are not available, [24] and this results in excessively heavy demands both on the time and effort of the geographer in land use inventory by ground survey methods. Especially in areas of rugged terrain, such as Nepal, on-the-ground mapping of land use becomes an exceedingly difficult and tedious task for the geographer.

In Nepal the physical conditions combined with the unavailability of vertical air photographs necessitated a different technique for land use mapping involving the use of low-oblique photographs taken from light aircraft with a 35 mm. camera held in the hand. This form of survey, originally developed by MacFadden, [25] was successfully employed in the land use inventory of Nepal. From the low-oblique 35 mm. colour slides a land utilization map was prepared by the senior writer in six weeks time with the assistance of two graduate students of the Department of Geography, University of Kentucky. A similar

[18] Northwestern University (1952).

[19] Hudson (1935).

[20] Results of several small-scale land use mapping projects in South Asia have been reported in the *Oriental Geographer* (Dacca), *National Geographical Journal of India* (Banares), *Punjab Geographical Review* (Lahore), *Geographical Review of India* (Calcutta), and *Malayan Journal of Tropical Geography* (Singapore). Space will permit only a partial listing of the significant recent studies in Asia and Africa: *Bombay Geographical Magazine*: Land Use Special, VI-VII, 1, September 1959, Bombay Geographical Association, Bombay, 112 pages; R. P. Moss, 'Land Use Mapping in Tropical Africa,' *The Nigerian Geographical Journal*, 3, 1, December 1959, pp. 8-17; B. Christopher, 'Land Use in the Border, Eastern Cape Province,' *Erdkunde*, XIV, 3, August 1960, pp. 195-204; D. Williamson, 'Land Use Surveys at Bunumbu (Sierra Leone), and Cape Coast (Ghana), *Bulletin of the Ghana Geographical Association*, 5, 1, January 1960, pp. 13-20; Thomas R. Tregear, *'Land Use in Hong Kong and the New Territories,'* Hong Kong University Press, 1958; R. Wikkramatileke, 'Problems of Land Use Mapping in the Tropics: An Example from Ceylon,' *Geography*, 44, 2, 1959, pp. 79-95.

[21] Rawson (1957): 60-3.

[22] Christodoulou (1960).

[23] Hodges (1960): 96-105.

[24] Stone (1959): 2-6.

[25] MacFadden (1949): 188-200.

Photo: P. P. Karan

Fig. 11. Over-grazed forest lands in the Mahabharat Range. Branches of trees are cut for fuel and fodder.

Fig. 12. A Rai village above the Arun river, east Nepal.

Photo: Peter Webster

map prepared by ground survey methods would have occupied the same team for many months of field work. In view of the need for land utilization maps of inter-tropical areas it is believed that the methods applied in Nepal would yield useful and rapid results in other underdeveloped areas. Therefore, the requirements for this form of survey, and stages by which the land use map can be prepared, are described below with special reference to Nepal.

Preliminary Aerial Reconnaissance and Formulation of Field Plan

The first step is a comprehensive aerial reconnaissance of the region to be mapped. This gives the geographer an over-all view of the area to be photographed, aids in the formulation of an effective field plan or schedule, and helps in determining the scheme of land use classification in the survey and the degree of generalization to be used in mapping.

For purposes of reconnaissance (and later land use mapping by photography) Nepal was divided into 28 major rectangular units, each unit enclosing one degree of latitude and longitude and covered by a topographical sheet (1:253,440 or 1 inch to 4 miles).[26] Each of these major units were further sub-divided into four smaller rectangular units, each division enclosing an area lying between 30 minutes of latitude and longitude. This resulted in a mosaic of 75 small rectangular units covering the entire area of Nepal. (Some of these units near the border covered only a portion of Nepal.) These smaller divisions were marked on topographical sheets (1:253,440) in advance and served as basic units for photography and land use mapping. The area covered by the small rectangular unit was first identified on the base map as accurately as possible before low-oblique aerial photographs were taken.

It is essential to make notes, sketches, cross-sections and field diagrams of the area to be photographed, and key these to the base map for purposes of later identification. The identification of areas during reconnaissance for photography is a critical problem. Much experience is needed to identify areas and key them to the base map. The success of the land use survey depends to a great extent on the successful identification of areas during, and after, flights when transferring details of land use from the colour slides on to the base map.

Aircraft, Camera, Film and Photography

Light aircraft (such as the Tiger Moth which we used in this study of Nepal) having slow cruising speed, stability, wide-angle

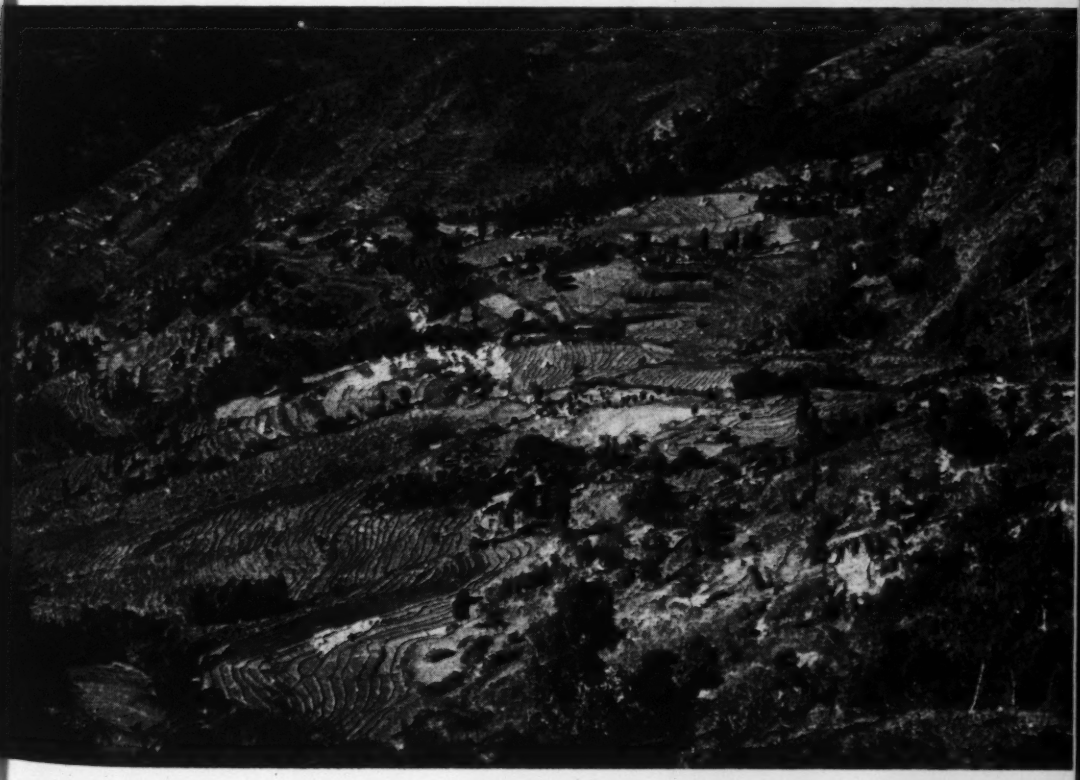
[26] The quarter inch (1 inch to 4 miles) topographical sheets of Nepal (based on reconnaissance survey of 1924-6) published by the Survey of India, are the only maps available. These were used as base maps for plotting land use from the colour transparency slides. The following 28 sheets cover all of Nepal: 63 E, 63 I, 63 M, 72 A, 72 E, 72 I, 72 M, 78 A, 72 B, 72 F, 72 J, 72 N, 78 B, 62 B, 62 F, 62 J, 62 C, 62 G, 62 K, 62 O, 62 P, 62 D, 62 H, 62 L, 71 C, 71 D, 71 H, 71 L.

Photo: Peter Webster

Fig. 13. Rice terraces in the foothills. Nepalese settlers in southwest Sikkim.

Fig. 14. Rice terraces and orange groves on the margin of cultivation in an area of dispersed settlement. Nepalese settlers in southwest Sikkim.

Photo: Peter Webster



ground visibility and ease of operation, are excellent for this type of land use inventory. The field geographer can fly solo and observe, sketch-map or take pictures at the same time. In the extensive land use inventory of Nepal a local pilot proved valuable as guide and landscape interpreter, especially in identifying specific areas on the base map.

Flying from Katmandu and points along the Indian border the whole area of Nepal (except the barren and snow-capped Great Himalayan region) was photographed between the months of May and August. (See black and white print of the 35 mm. colour slide, Fig. 7). Eastern Nepal was photographed first in May and June because monsoon rains start early in the east, and western Nepal was covered later in July and August. Flights were made only on clear days in good sunny weather, and several days were lost because of the rains and overcast sky. Given good weather and flying conditions, a country the size of Nepal can be photographed for land use mapping in about three months if one works an average of four to five hours daily.

In order to localise the pictures taken, the area to be photographed on a particular flight was carefully located on large scale topographical base maps during advance reconnaissance. Whenever feasible, all obliques were exposed in a north direction for easier identification. Rivers, trails and other striking features in the landscape served to localise the exposure area on the base map with a high percentage of reliability.

Any ordinary 35 mm. camera which is light in weight, simple to operate, and has low film cost is suitable for aero-field work. The American-made Argus and the German-made Praktica, both equipped with focal plain shutter, were used in Nepal. Although black and white as well as colour film can be used, colour photos comprise all of those taken in Nepal. Colour film, in spite of its slow speed, gives far superior results (if exposed in bright sunlight) in recording land use than the simple black and white film on which land use features are often difficult to identify. The chief drawback of colour film is that it can be used only on clear, sunny days, but the ease of identifying land use patterns on colour film more than compensates for its demerit. Colour film offers the geographer both the advantages of details available from low altitudes and the shadings of natural colour in transfer mapping purposes. Film exposure was determined by an ordinary light metre. Fast shutter speeds, preferably 1/200 to 1/500 of a second, were used as a caution against the blurring of detail. An ultra-violet filter was used to correct the hazy conditions which are common in mountain areas.

In the intensively cultivated areas of Nepal oblique photographs made from a height of approximately 800 to 1,000 feet above mean ground level gave extensive ground cover in enough detail to map the land use pattern. If a telephoto lens is used, higher altitudes can be flown with equal or even better results. Greater detail or greater generalisation was obtained by making photographs at varying altitudes, depending upon the particular area of the country. Thus in the mountain areas, uniformly covered with dense vegetation and having little complexity of land use, photographs taken from 3,000 feet and occasionally even higher gave large ground area coverage in good detail for mapping. In other areas, such as the valleys, close-ups were necessary to map the complex land use pattern. Owing to the limited financial support of this project, large areas of barren wasteland in northern Nepal covered by alpine tundra and glaciers (Fig. 2) were not photographed.

Preparation of the Land Use Map

The 35 mm. colour transparencies obtained by the above method were arranged in order for each of the smaller rectangular units in which Nepal was divided for purposes of reconnaissance, photography, and land use mappings. Each transparency was then projected on paper, and boundaries of the several kinds of land use were sketched on it in sequence. Traces showing the land use boundaries were thus made for each of the 75 small rectangular divisions. These traces were arranged in mosaic and reduced photographically on a scale of one inch to ten miles. For publication purposes, the original land use map was greatly reduced.

This simple projection method, using an ordinary 35 mm. slide projector, was most effective in transferring land use from the colour transparencies to the maps. Only the areal distribution of cultivated, grazing, forest land, and wasteland was plotted on the land use map. Other uses of the land such as settlements and roads, although important from an economic standpoint, occupy very small areas in Nepal and therefore are not shown on the land use map. However, it is possible to project the colour slides on a large scale, and a great amount of detailed land use pattern can be plotted from them, depending upon the degree of generalisation desired.

Now the field geographer can greatly simplify and expedite the land use inventory of large areas in inaccessible and underdeveloped countries with the use of light aircraft and an ordinary 35 mm. camera as a comparatively inexpensive and versatile field tool combination. Experience in Nepal demonstrates that the tedious field survey on the ground can be largely dispensed with to map land use patterns in adequate detail for agricultural planning in underdeveloped areas.

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The Conflict of Salmon Fishing Policies in the North Pacific

JULIAN V. MINGHI

INTRODUCTION

The North Pacific Salmon Fisheries issue is one of true international proportions, involving Japan, the United States, the Soviet Union, and, to a lesser extent, Canada.

The political geographer is interested in the effects of the competing interests of nations and the differences these interests produce upon the use of natural resources. The salmon are a highly, but not completely mobile natural resource which range across existing political boundaries into areas where unambiguous spatial sovereignty is difficult to maintain. The problem this condition creates is considered in this study both from a legal and a geographical point of view. Conflicts between national salmon fishing policies have been traditionally adjusted by legal means by international treaties, generally according to the wishes of the dominant power. The aim of this paper is to present a survey of the forms, origin and background of the current salmon fishing policies and legal position of the United States and Japan. Also considered is the compatability of existing and proposed legal arrangements with the ecological realities of the salmon cycle and with the economics of salmon fishing in the North Pacific.

Traditionally, marine resources on the high seas can be utilized by all mankind, and become private property only when caught. However, the problem is more than just the conflict over the exploitation of a valuable marine resource of the North Pacific. The peculiar nature of the salmon complicates the problem further. The salmon spawns and hatches in fresh water streams. By beginning and finishing its life cycle within the boundaries of national domains it comes within the full jurisidiction of the coastal state, that is, while it is not on the high seas. Hence, for the coastal state, even the usual basic premise in disputes involving fishing outside territorial waters, that the living resources of the high seas are common to all mankind is overshadowed by property claims. This leaves even less common ground than usual among the contestants. In the dispute in question, the United States occupies the position of the coastal state, while Japan which fishes on the high seas, holds to the traditional philosophy of the freedom of the

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Julian V. Minghi is a pre-doctoral associate of the Department of Geography at the University of Washington in Seattle.

seas. The policy emanating from the United States position is clouded by conflicts among different private interests and government agencies, such as those between the United States Department of the Interior and the State Department, the former giving paramount importance to a policy of conservation, and the latter primarily interested in international relations.

The salmon of the North Pacific present such a complicated resource problem that the value of this study lies in the summaries and generalizations attempted which are based on the evaluation of the many factors and points of view involved. The urgency of the problem requires generalizations in the political and economic fields even if other scientific researchers cannot yet fully sanction these generalizations on the evidence presently available.

Salmon involved in the dispute in the North Pacific Ocean are spawned and hatched in Asian and American waters. The Asian-spawned salmon are mainly from Soviet Siberian streams, while the American-spawned are mainly from Alaskan streams, specifically those flowing into Bristol Bay. Because of their strong homing instinct the salmon, after three to five years on the high seas, return to their parent stream. Salmon in climbing upstream to reach the spawning grounds deteriorate in their physical state. Hence, they are of greater commercial value as they enter fresh water from salt water than at any other time thereafter. The necessary concentration of the salmon as they run towards their parent streams from the open sea renders commercial exploitations easiest at the mouths of these streams.

Commercial exploitation of salmon in Siberia and Alaska began, therefore at river mouths along the coasts. The seasonality of the salmon runs, the remoteness of these areas from markets, the high unit-weight value and the severity of the climate in winter, have given this form of economic activity some peculiar characteristics. The salmon catch, a highly perishable commodity, must be conserved to reach the market in an acceptable condition. This has led to a heavy capital investment in a large canning industry in these remote areas. The salmon run only in the summer months. Since there are few or no off-season employment opportunities, labour in the fishing and canning industries in these isolated areas migrates seasonally. Commercial salmon fishing has continued in this fashion in Bristol Bay under the direction of United States labour and industrial interests and by the Japanese, under a lot-renting system from the Russians, along the Siberian coast. Japan began high-seas fishing for salmon off Siberian waters in the early 1930s. Later in the decade, Japan entered Bristol Bay with experimental and survey vessels with alleged intent to extend large-scale salmon fishing activity to these waters in the future. After protests from the United States Government, Japan announced that she would not fish in Bristol Bay in the future, and withdrew. How-

ever, the problem of the conflict between the coastal state and the high-seas maritime nation over the exploitation of salmon had been raised for the first time in the North Pacific.

After the War, measures were taken by the United States to exclude Japan from fisheries where salmon spawned in Bristol Bay streams occur. By the terms of the Treaty of Peace, Japan was committed to enter into negotiations with other countries, and hence joined Canada and the United States as a party to the International North Pacific Fisheries Convention (I.N.P.F.C.) in 1953. In the early 1950s the only Pacific nations with active interests in commercial salmon fishing were Canada, the United States, Japan, and the U.S.S.R. Although the Soviet Union had been actively fishing salmon on an increasing scale since the 1930s, her activity was confined to coastal fishing along the Siberian coast. Added to this was the fact that the Soviet Union shared little common political interest with the other three nations. Hence, it was possible for Canada, the United States and Japan to agree on measures covering most of the North Pacific that would apply to themselves, and would theoretically exclude "newcomers" from catching salmon in convention waters. The area of the North Pacific covered by the terms of the I.N.P.F.C. is 3.2 million square miles, and contains approximately one-third of the world's fish resources.

The I.N.P.F.C. members agreed that, under certain conditions, they would abstain from catching salmon, and also halibut and herring. Hence a "piecemeal" approach to the fishery problem was adopted. The Japanese agreed not to catch salmon of North American origin, and asked if a line might be established in the North Pacific which would facilitate their complying with the agreement. Thus, on the scientific evidence available at the time, a line at 175 degrees West was established to divide the Asian and American salmon by origin, East of which the Japanese would not fish. This set up a zone contiguous to the American coast within which no parties of the Convention could fish for salmon. It has since become known as the "zone of abstention." At the time, this line was thought to divide satisfactorily American-spawned salmon from Asian-spawned. In international law there is a lack of acceptable procedures and principles for delimiting any contiguous off-shore zone of a coastal state in order to carry out an intended conservation policy. Hence, such a zone as this can only be established by mutual consent between interested parties, and can only be changed under the same terms. The view of the American fishery interests is that the "doctrine of abstention" is an outgrowth of the concept of "historic rights," which in turn is based on the notion that, by virtue of the location of the spawning grounds and the history of sole exploitation, the salmon are an American resource, and hence American property. There is no way

for fishermen to recognise the distinction between Asian and American-spawned salmon, and only lately have biologists been able to differentiate. However, the official United States' view, which is that of the State Department, is that the abstention doctrine is valid: (1) when the resource is being fully utilized and there is no waste; (2) when the resource's continued productive state is due to the research and regulations enacted by the countries exploiting the stock; and (3) when all countries presently participating in the fishery are allowed to continue to do so.

Ironically, the present conflict arises as a result of protests by the United States, the architect of the convention's measures, against the activities of Japan in assigned waters. Japan's high-seas fishing catch has been increasing and the runs in Bristol Bay have been falling. The Fish and Wildlife Service of the United States Department of the Interior has adopted a conservation policy which demands that there be a minimum escapement allowed upstream to ensure propagation of the salmon at a sustained yield level. Hence, partly due to Congressional legislation based on inadequate scientific research, catches have fallen more rapidly in Bristol Bay than they would have done, even taking into consideration the diminishing runs of salmon. The explanation of the over-all depleted stocks of salmon has yet to be found. American fishery interests think over-fishing by Japanese fishermen is largely to blame for the depletion in 1957 and 1958, in the belief that the 175 degree West line is, after all, misplaced, and does not satisfactorily divide Alaska-spawned stocks from Asian-spawned. For the explanation of the drop in the total run, however, one must go back considerably earlier. That catching of these salmon, *even* west of the abstention zone, is held to be contrary to the "spirit and intent" of the treaty. Consequently, the United States now urges that the abstention line be moved westward. The Japanese argue that the line can only be moved if conclusive scientific evidence can be produced to show that the line does not conform to the convention's intentions.

The convention obligates the signatory powers to carry out scientific research into all aspects concerned with salmon and their movements on the high seas. The results so far show that there exists a broad zone of intermingling of Asian and American-spawned salmon. There is also great variation in the size and movements of stocks of these salmon from one year to another and annually of different species of salmon. Thus, Japan argues that there is no conclusive evidence as yet, and that there will possibly never be a basis for moving the line within the terms of the convention. Obviously a time will come when two lines could be drawn based on biological evidence. One would mark the absolute eastern limit of Asian-spawned salmon, and the other the westernmost limit of American-spawned salmon. If future evi-

dence follows the trends of the findings so far, these two lines would be extremely wide apart, and would contain a number of intermingling salmon. The United States of course, would support the westernmost line, and in fact, has proposed a move westwards of 15 degrees, to 170 degrees East. Japan would use the argument for the eastward line as a counter to the United States proposal, and also as justification for not moving the line from its present position.

From the above reasoning several points arise. The inherent difficulties behind establishing a line running North and South across an ocean to divide salmon by origin can now be seen. The 175 degree West line was meant to be provisional, an administrative procedure to solve an immediate spatial fishery problem. Although this practical solution was meant as a temporary compromise at a certain point in time, inertia set in, as with any provisional line where vested interests are vitally involved on land or on water. The selection of the 175 degree West line in 1952 for the division by origin shows the fallacy of founding legislation on scant scientific evidence, rather than determining if a certain type of legislation would be effective scientifically, and if so, establishing measures accordingly. Lines of absolute limit of one origin or another could eventually be drawn, but any line in between would merely cut through the zone of intermingling. In the case under consideration it seems that in the immediate future no *one* line can be drawn on a scientific basis, whether all parties agree to the principle of equitability by origin or to one of equitability by some quantitative measure involving different species of salmon. Any such line would have to be based on many years of data collection. As with other problems in the natural sciences, there has existed a need for many years of intensive research if prediction techniques are to be developed to such a degree that a movable line, or several lines for several species, can be delimited annually. Under presently-known techniques, although there have been considerable improvements, such delimitation would be impossible.

The basic difference of opinion is not one of a scientific nature but one of attitude. Although the United States and Japan are parties to the same convention, Japan does not share the philosophy upon which the convention is based, a philosophy of abstention and equitability by origin. Japan herself however, is in no position to counter American claims with arguments using the same philosophy because the bulk of the Asian-spawned salmon, and by far the greater part of the Japanese catch on the high seas in the post-war period, is of Russian origin. Ever since the 1930s Japan has been progressively constricted in Siberian coastal regions. High-seas fishing temporarily solved this problem, although it has raised others with the United States. Now Russia is evidently also beginning to indulge in high-seas fishing

for salmon,[1] further complicating the issue, for although she is fishing largely for salmon of her own origin, she will be competing with Japan, and antagonizing the United States. She is not a member of the I.N.P.F.C. and will presumably fish exclusively under her own regulations. One thing is certain. In the words of Milton E. Brooding, spokesman for the United States National Section at the 1958 I.N.P.F.C. meeting, "Bristol Bay sockeye runs can be exterminated if both of these intensive fisheries—the Japanese high-seas fishery and the United States inshore fishery—are not adequately regulated."[2]

THE JAPANESE CASE

Background

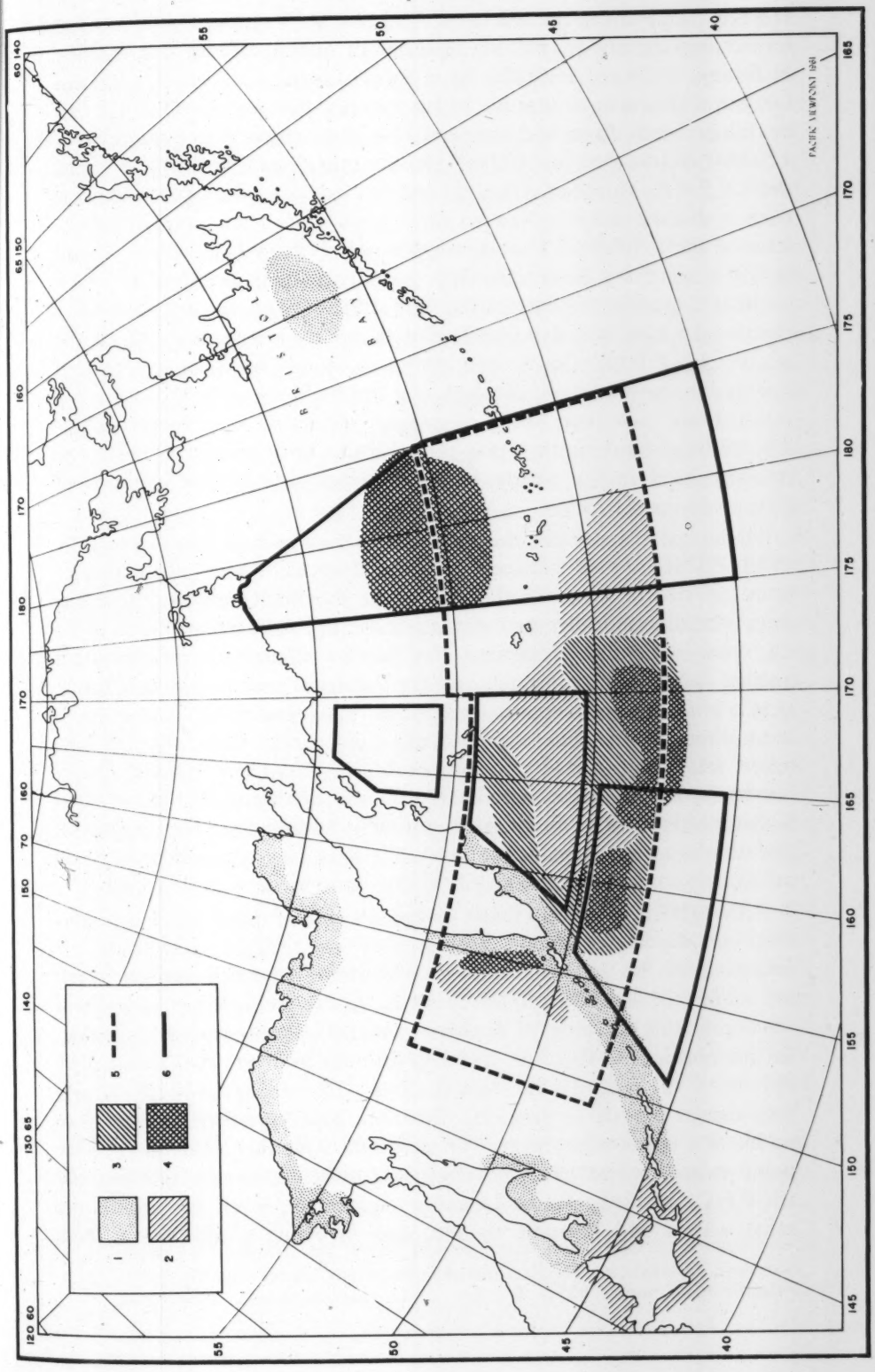
Although salmon is not of great relative importance in the total Japanese fishery economy, the great expansion of the export market is largely due to increased exportation of canned salmon to the United States, to which 45 per cent of Japan's total value of salmon exports is sent. European demand for Japanese canned salmon has also risen in the last few years.

In the period since 1930 the great feature in salmon fishing has been the increased efficiency of the mother-ship system. Catch per vessel increased tenfold during the period 1930 to 1935. Over the same period the number of catcher-ships increased at the same rate, although through technical advances the number of mother-ships needed to handle this increased productivity has merely doubled. About 90 per cent of Japan's total salmon catch comes under the realm of the mother-ship system. The vessels are equipped with such modern devices as ultra short-wave radio which allows a working radius of 35 miles from the mother-ship, fish detectors, echo-sounders, direction finders, gyro-compasses, radar and even aqua-television. The mother-ship programmes the orderly arrival and discharge of her catchers, to avoid loss of time and confusion. Ever since the resumption of this type of salmon fishing soon after the War, there has been a progressive increase in productivity due to the increase in the efficiency of effort, and to a larger North Pacific population of salmon in the immediate post-war years.

The post-war scene has been characterized by the limitation of Japanese activity in salmon fisheries under various agreements with the

[1] So far there is evidence only of research fishing. Under Soviet regulations only traps and seines are permitted. Gill nets are outlawed as injurious.
[2] I.N.P.F.C. (1959): 53.

Fig. 1. The History of Japanese Salmon Fisheries. Key: 1. Pre-War areas, 2. Post-War light catch, 3. Post-War medium catch, 4. Post-War dense catch, 5. Japanese Govt. authorised fishing area, 1954, 6. Soviet proposed fishing areas, March, 1959.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ALASKA
PACIFIC VIEWPOINT 1961

U.S.S.R., and under the terms of the I.N.P.F.C. (Figs. 1 and 2). The former agreements are flexible in terms of quotas, season and location of fishing, and vary annually. By a Russo-Japanese fisheries agreement for the 1958 salmon season, Japan cut her fleet in the Okhotsk Sea by 50 per cent from the previous year, and reduced her quota from 120,000 metric tons to 110,000. On the other hand, by its very terms, the I.N.P.F.C. has been inflexible and has led to a *status quo* which has been a distinct disadvantage to the United States, the original formulator of the I.N.P.F.C. The Japanese-Soviet Fishery Convention, signed in 1956, gave the Soviet Union a good bargaining position by which to limit Japanese fishing activity still further. The Soviets were in a position to take action on unilateral decisions, whereas, by the terms of the I.N.P.F.C., the United States is not. The Soviets have cut quotas on presumption of depletion through overfishing, and as a result there has been much Japanese irritation over Soviet policy. The Fishery Convention settles no problems on a long-term basis, but resolves itself into a yearly battle in which scientific research is of little or no consideration.

In the present decade, deep-sea fishing has been a basic issue. The 1956 Fisheries Pact between Japan and the U.S.S.R. place restrictions on size of catch in the Northwest Pacific. Questions, however, were settled politically, and not scientifically. Agreements were made on scanty scientific evidence. The Soviets argued for conservation against indiscriminate fishing, and the Japanese maintained that statistical data did not support the thesis that stocks of salmon were diminishing. At a conference in Tokyo in March, 1959, the U.S.S.R. made staggering curtailment proposals for the 1959 salmon fishing season to Japan. After more than a month of discussion, the original Soviet proposal of a quota figure totalling 50,000 tons had expanded, and the Japanese demand for 160,000 tons had contracted to reach an agreed compromise quota of 94,000 tons for the 1959 season. [3]

Although these latest Soviet proposals would place severe limitations on Japanese salmon fishing, they do recognise the right, or necessity, of the Japanese high-seas operation to catch salmon which are mainly of Russian origin. There is, so far, no attempt to prohibit absolutely the catching of Russian-spawned salmon by the Japanese. In this respect the Russians differ in attitude from the Americans. The difference is basically an historic one. The Japanese were largely responsible for developing the Siberian fishery, whereas they have no historic rights whatsoever over the North American salmon. Another point raised is the possible conflict between the two treaties, the I.N.P.F.C. and the Russo-Japanese Agreement, over potentially the same waters and resource therein, and involving a member of both

[3] *Pacific Fisherman* (1959): 1

treaties, i.e., Japan. This possible conflict of regulations would seem to illustrate as unwise the conclusion of different treaties over waters which essentially form one unit in terms of high-seas fishery regulations. Of course, it can be argued that, although the high seas form a legal unity in the North Pacific, there is a division of stocks based on origin. The intermingling of these stocks during the migration period and the Japanese high-seas fishing activity in the intermingling area, serves to blurr this distinction based on origin-division. As Senator Magnuson of Washington has said, if the purpose of the I.N.P.F.C. is to conserve and perpetuate salmon resources, it "must include all four nations substantially utilizing that resource." [4]

In a way these latest Russian proposals are a continuation of the annual discussions which occur between Japan and Russia before every fishing season over salmon fishing regulations in the Northwest Pacific. However, the 1959 proposals are unique. For the first time they have considered waters up to the I.N.P.F.C. Abstention line to be "treaty" waters, and have placed limitations on them accordingly. In doing this, the U.S.S.R. has adopted the same arguments of "conservation" and "special rights" of the coastal state, as the United States had adopted to protect its interest, although the abstention philosophy of the two powers is considerably different.

The history of the I.N.P.F.C. has been equally turbulent. At the annual meetings of the convention, national policies are aired, and supported as best as possible by scientific evidence prepared by each country's research group during the previous year. Increasing catches by Japanese fleets in assigned waters have contrasted with a steady decline in the Bristol Bay runs. At the last two meetings the United States has demanded that the line of abstention be moved westwards. On the other hand Japan has seemingly made several concessions. During the 1958 season Japan agreed to restrict operations near the 175 degree West line, and also agreed to a quota. In fact the Japanese fleet did not fish east of the 170 degree East line. These promises were extracted from Japan at the threat of possible economic sanctions instigated by American industrial and labour interests. If the Pelly Bill [5] or several other similar bills were made law and enforced, the Japanese salmon canning industry would suffer a great loss of market. It is of course an open question whether the Japanese fleet stood by her promises purely as a friendly gesture, or because of the absence of fish in the vicinity.

Early in 1959, following the announcement of the closure of Bristol Bay to salmon fishing for the 1959 season, American antagon-

[4] *Pacific Fisherman* (1959): 29

[5] A bill before Congress that would ban the importation into the United States of canned salmon caught under circumstances illegal to American fishermen, i.e., all Japanese canned salmon.

ism against the Japanese developed to a degree reminiscent of the 1930s. The United States' Secretary of State has been petitioned by Pacific Northwest and Alaskan senators to bring the State Department directly into the issue, just as Cordell Hull had been petitioned over 20 years before. Threats to pass legislation which would ban the importation of Japanese salmon were renewed. On the other hand, the Japanese allege widespread misunderstanding of the causes of the depletion of Bristol Bay salmon, and deny that their high-seas fishing activity is responsible.

International Law Standing

In general terms the Japanese case rests on the traditional international law concept of the freedom of the seas. Japan is one of the staunchest supporters of the three-mile limit rule. Japan's case is centred on her attitude toward the control of the exploitation of the riches of the sea, and to the doctrines of the contiguous zone, and the coastal state.

Japan maintains that the coastal state is not allowed to claim the exclusive exploitation of natural resources under any other institution than that of the territorial sea. The Japanese distinguish between the problem of marine resources, especially the conservation of biological resources, and the problem of the contiguous zone. The doctrine of the contiguous zone cannot be interpreted to justify a monopoly of fisheries outside territorial limits, since a monopoly can be asserted only as an exercise of the right of sovereignty within an area subject to sovereignty. The maritime states, with ability and improved techniques for fishing on the high seas, will never renounce the rights of exploitation established thereon.

The area between the three-mile limit off the Alaska coast and the 175 degree West line of abstention is certainly in the "contiguous zone" class. The monopolistic connotations of abstention zones declared unilaterally by a foreign state are obvious. The suspicion and fear entertained by Japan over these declarations have been well grounded in the Kamchatka Sea, where, in 1956, a monopoly of high-class salmon fishing was set up by the unilateral action of the Soviet Union. Japan supports the traditional principle that the freedom of the seas cannot be violated by any unilateral declaration or by any new theory. Japan recognises the need for conservation, but with regulations set up by conventions between interested parties.

One of the notes, discussing the place of the coastal state in a fishery conservation programme, in the Report of the Rome Conference in 1955 states that no conservation measures should be taken by the coastal state on the high seas without international agreement. The reasoning behind this is that conservation measures are based on scientific and technical evidence, and the coastal state has not neces-

sarily got the best, let alone a monopoly of such evidence. Hence, all users should have equal rights to supply information and to formulate measures. Consequently, Japan argues that there is no reason to elevate the coastal state to a superior position. Geographical position alone is not evidence of interest or scientific knowledge about conservation. Mr Tsuruoka, a member of the Japanese delegation at Geneva in 1958, declared: "As the concept of conservation is primarily scientific, and not political or economic in nature, the coastal state should have no unilateral rights to regulate fisheries by virtue of its geographical position."[6] The argument that the coastal state is in a "special position" based on social and economic reasons is considered untenable. Such an idea could lead to abuse of foreign fishermen, and also to under-fishing. The very purpose of a non-coastal state fishing so far afield is explained by the lack of adequate resources available near home to sustain its population. To cut off non-coastal states from these distant resources would deprive a large section of the population of their present standard of living.

According to the Japanese point of view the abstention theory, which forms the basis of the I.N.P.F.C., is held invalid because it lacks a scientific base, and hence has nothing to do with conservation.[7] The main seed of controversy in the dispute hinges on the line of abstention and the "zone of intermingling." The possibilty of Asian and American salmon intermingling was realized in 1951, and the 175 degree West lines was meant to be a temporary measure. To move it, three process stages are provided under the convention: (1) scientific investigation up to a point when conclusive evidence of a discrepancy between the line, and the location and movement of salmon of different origin is available to support a shift; (2) political and diplomatic approval; *and if this fails,* (3) an impartially decided scientific line. The convention is still concerned with stage one. From the American point of view there has been some success because the Japanese have been kept west of the abstention line and away from Japan's alleged just claim of up to the three-mile limit. Japan, who has opposed the abstention principle that she feels the convention forced on her in 1951, is obviously in no mood for further concessions. Japan contends that arguments to move the line westwards are arbitrary, and based on extremely insufficient scientific data, and that to move the line *now* would be to scrap the convention. She also contends that proof is insufficient that there are large proportions of American-spawned salmon among the different species in the intermingling zone.

The freedom of the seas concept is the corner-stone of the Japanese case. In the past Japan has used this concept aggressively, but

[6] United Nations (1958): 7.
[7] United Nations (1958): 41.

now she is using it to defend her position against further loss. As a signatory to the convention she has prejudiced her position somewhat. Japan, however, has since taken a very strong position against any further extension of the abstention doctrine and the coastal state concept. She has to be very careful not to set precedents in policy in the convention, which would be detrimental to her position in other fishing disputes with other states.

At present, Japan's population has been increasing by 700,000 annually. To offset the threat of economic chaos the standard of living must be maintained and improved, and the greatest possible resource base must be sought in order that technical and organizational innovations may be fully utilized. In her effort to expand her fisheries, Japan has had to vary her policy to reach compromises in different situations. A programme suggested in 1949 for the future of Japanese fisheries proposed such measures as reorientation and improvements of fishery methods, improvement in collection and computation for production statistics, reappraisal of legislation, improved handling and transportation of fish, exchange of fishery products on the foreign market, and expansion of fishery areas.[8] Since then, under national guidance, all these measures have been carried out, but the expansion of the fishing industry has met with international complications, and Japan has only submitted to limitations on this policy when conclusive scientific evidence has shown that the fishery in question is becoming seriously depleted due to over-fishing. The high-seas salmon fishery operates under such adverse conditions as foul weather (about one-third of the days during the season are impossible for fishing) and conservation measures. There are restrictions on the length of nets, the size of mesh, as well as the distance between nets. Quantity of catch is regulated by quotas, and all fishing is prohibited after 10 August. Even given continuous good weather, the nets are down in water for a maximum of 42 hours a week. The great economic potential, flexibility, a real mobility, and high order of technological efficiency, has given the mother-ship system the greatest possibility of success. With this fact of economic success and that of heavy capitalization in the industry, the other arguments for the Japanese case, those of dependence upon exports on this high-value, low-bulk product, of protein, diet and occupational dependence are reinforced.

THE UNITED STATES CASE

Background

Salmon fishing is of only local and regional significance in the United States. It has lost much of its pre-war importance in terms of labour, taxes rendered and installed capital.

[8] Espenshade (1949): 82.

The salmon-fishing industry has formed an integral part of the regional economy of the Alaskan coast, and salmon fishing is still the most important fishing activity there in terms of value. Diminishing runs of salmon, domestic conservation legislation and foreign competition have rendered the industry unable to keep pace with the steady growth of domestic and foreign markets. Imports, principally from Japan, are annually more able to compete in the domestic market. Imports of canned salmon for 1958 showed a 25 per cent increase on those of 1957. Japan accounted for 73 per cent of the total canned salmon imports of United States. During the years of increasing catches up to the mid-1930s, the industry was characterized by the domination of a half-dozen large firms which forced the smaller firms out by their ability to lead in the pricing field and by virtue of the economies of scale and vertical integration they enjoyed. Decreasing runs of salmon have led to diseconomies of scale, to the failure to reach threshold requirements, to lower productivity and, consequently, to a finished good at rising cost. Despite this drop in economic importance the industrial and labour interests concerned continue to have a strong political voice. All the companies together have maintained for some 30 years a negotiating body, The Alaska Salmon Industry Inc., while the Alaska Fishermen's Union represents the labour interests of the seasonal workers in the salmon industry. Because of the seasonality of employment, the industry has some extra-regional importance. A large proportion of workers come from the Puget Sound area. There are few opportunities for work in the off-season. The isolation of the industry along the Alaskan coast means that the organisation centre is on Puget Sound. In fact, the capital investment and profit sharing involves many Pacific Northwest interests.

The basis and growth of the Alaskan economy has depended upon the exploitation of minerals and fish. Mining is a "robber" economy and its raw material is irreplacable. In fishing, however, a policy designed to maintain an optimum level for exploitation is thought possible. Alaskan Statehood will doubtless lead to a decrease in dependence on Federal funds, and a growing increase in the responsibility of the new state to balance its own budget. Taxes on fisheries have for some time been the chief source of Alaskan revenue, and the fisheries produce an export surplus in the balance of trade. Moveover, in terms of total value over the long run, salmon have contributed more to the economy of Alaska than all the gold mined there.

Historical Context of Salmon Fishing

The development of the industry in Alaska has been basically conditioned by the character and location of its raw material supply. As mentioned above, the peculiar characteristics of the salmon are such that the ideal time and place to catch them is at the river

mouths where they run in large schools near the surface before ascending the freshwater streams to spawn and die. Before technical advances made mass-exploitation possible on the high seas, it was most convenient and profitable to begin salmon fishing, as the Japanese had begun in Siberia, in waters close to the shore and at river mouths. It is still sounder economics to fish for salmon at the river mouths, but for obvious political reasons this is no longer possible for the Japanese.

Because of its marginal geographical situation, Bristol Bay did not come under intensive salmon fishing activity until the early years of this century. Due to its physical excellence in terms of factors controlling quality and quantity of salmon runs, it was exploited successfully with increasing returns until the late 1930s. As a result of bitter lessons learned in the past along the entire Pacific Coast, a conservation policy was adopted even in the early days of salmon fishing activity in Bristol Bay. Since early Congressional legislation in 1906 proved not particularly effective, the White Act was passed in 1924. Under the White Act the Bureau of Fisheries was given full power over all fishing in Alaska. The act provided for at least a 50 per cent escapement of all salmon entering the rivers to spawn. It was recognized that the number allowed up the river to spawn, known as the "escapement," was related to the size of the run a few years hence, and that conservation based on a "minimum escapement" policy would render a direct return in the area applied, thus initiating a principle of optimum sustained yield. This would make for a very close spatial relationship between sacrifices made, and benefits reaped.

Up to World War II, the Alaska salmon pack led the world in output. In 1935 Freeman wrote, "so far the Asiatic output has not seriously disturbed our markets." [9] Within the last decade the picture has changed considerably. Salmon runs have been steadily falling since 1935 despite the minimum escapement policy strictly adhered to by the United States Fish and Wildlife Service (F.W.S.). Catches have dropped accordingly. Techniques developed in recent years have been prohibited by law in the interests of conservation. Decisions about areas and times allowed for salmon fishing are often made during the season by the F.W.S. Federal Law forbids United States citizens taking salmon by nets on the high seas. The fish trap which, in economic terms, is the best method of catching salmon, is also forbidden. Quality is a prime requisite for success in the salmon canning industry hence the time between death and canning must be as short as possible. Fish traps are ideal for minimizing this critical period because the supply to the cannery can be stabilized by leaving the salmon alive in the traps, and removing the mat such times and in such a number as

[9] Freeman (1935): 129.

the cannery might require. The F.W.S. has chosen to legislate in this way to avoid any sudden drastic dislocation in the industry. However, a satisfactory sustained yield has not been realised, and growing inefficiency, despite some organizational changes, has been characteristic of the industry since the War.

In 1957 the situation became critical. Over-fishing by the Japanese was blamed for the drop in the Bristol Bay runs. During the 1958 season the Japanese complied with an American request to fish only a given number of salmon and, if possible, to catch them all west of 170 degrees East. Again this was not an official agreement as the Japanese were much afraid of prejudicing their chances of a satisfactory agreement with the Russians, by openly agreeing to limitation with the United States. After preliminary warnings in December, 1958, the F.W.S. decided in March 1959, that, to ensure sufficient escapement to maintain the resource, Bristol Bay would be closed to fishing for the 1959 season, although, in late May 1959 after the Japanese had agreed to reduce fishing intensity for the 1959 season, the Bureau of Commercial Fisheries announced that a limited red salmon catch would be allowed in Bristol Bay. The relationship of escapement to runs has been reasonably good, except for 1957, when the Japanese high-seas fishery for the first time operated north of the Aleutians, catching some 20 million salmon, including about 70 per cent of all red salmon taken in the North Pacific that season. The non-materialization of the predicted run is circumstantial evidence that Japanese fishing affected the Bristol Bay run in that particular year. On the assumption that the situation is due entirely to Japanese fishing of Alaska-spawned salmon in water assigned to them under the I.N.P.F.C., both industry and labour have tried by various means to force Japan to agree on a westerly move of the present abstention line. Proposed legislation would also ban imports of Japanese salmon. For the last two years imported Japanese canned salmon had exceeded the total production from Bristol Bay. Further proposals would ban *all* fish imports from Japan. Such proposals have been justified as "conservation measures." [10]

The recent appearance of deep-sea Soviet fishing trawlers in the convention waters has further complicated the issue. Subject to no treaty agreements the Russians feel free to fish salmon outside the territorial limits of Alaska. However, a trawler does not normally fish for salmon, and there is no proof that Russian vessels in the eastern Bering Sea are, or will be fishing salmon. Japanese trawlers have been trawling for bottom fish for several years in the areas where the Russian trawlers have been currently located.

International Law Standing

There are divergent opinions as to exactly what the United States'

[10] *Seattle Times*, 3 *April*, 1959.

case is based upon. The views of the fishery interests on this point can hardly be accepted despite the wide support they have been given. The State Department is, after all, the spokesman for the United States in international law. The United States' case is based upon the philosophy and practice of a sound conservation policy, especially in this case where there is a real danger of extinction of the resource. These conservation procedures have been approved and recognised by most nations in both the Rome Conference on Conservation in 1955, and the Law of the Sea Conference at Geneva in 1958. There is also the special interest of the coastal state in a fishery conservation programme. The peculiar nature of the salmon gives the United States presumed grounds for the opportunity of claiming a property right over salmon which are spawned, hatched, have their early development, and return to die in national and territorial waters. Added to these two factors of "special interest" and "property" claims, the United States has also claimed a historic right for exclusive exploitation of this resource. The fishermen of the United States and Canada are held to be solely responsible for the maximum development of fisheries, and have enjoyed almost exclusive rights in them.

The first official statement of policy by the United States came in November 1937, from the then Secretary of State Cordell Hull, after the Japanese high-seas fishing fleet had spent a season researching and catching some salmon commercially in Bristol Bay. In a note to the Japanese Government he argued that both the United States Government and private interests had developed the salmon resource to its present state. A law of Congress protected the salmon and put strict control on fishing activity. All this the Japanese had ignored. In the light of the annual investment of the United States in conservation, the hardship of the industry and steady decrease in total pack, the United States claimed a superior interest in Alaskan salmon, and suggested that it was to be regarded as an American resource. Such doctrines as "prior occupation", "prescription" and "usage" were used to bolster the United States' case. As a matter of policy the United States could not abandon its control in this case without some domestic hostility and public disgrace. The pre-war question was one of conservation and competing national interests, for this affair came at a time when there was growing friction between the United States and Japan on policy in the Pacific area.

Since the War, the United States' case has little changed. In 1943, Tomasevich thought that, in terms of power of protection, fishery conservation should have the same standing as revenue laws or defence of a neutral coastal state against belligerent activities.[11] Even Japan voted for the "coastal state" measures at Geneva in the hope that

[11] Tomasevich (1943): 35.

the extension of exclusive fishing rights would not be pressed by other countries. On the presumption that the production of most fisheries can be maintained at a near-maximum with conservation policies, the United States argues that, with increased activity in fishing, the most important aspect of the international law of fisheries is the promotion of effective conservation. The doctrine of the freedom of the seas has never been absolute, and extra-territorial rights for various functions have always existed. Allen has stated: "There is a definite distinction between the right of sovereignty and the right to exercise protective or preventive jurisdiction over an area outside the national domain." [12]

There seems to be some conflict within the terms of the 1956 International Law Commission articles. [13] The regulations do not "limit or restrict the freedom of the seas" and yet they include provisions for compulsory abitration of disputes over fisheries conservation. This would seem to rule against the absolutist doctrine of the freedom of the seas as a premise, as it would deny the necessity of achieving a balance of competing claims. There was however, an accepted qualification to the freedom of the seas by which abstention would be practised under sound conservation measures.

On the grounds that any salmon caught before they begin to run from salt water to fresh water are immature, the Washington State Director of Fisheries, Milo Moore, claims that salmon "should rightfully remain unmolested on the high seas." [14] It is further held that the scale and manner of the Japanese operation "violates the law of nature," and that if such an operation continues, salmon fishing in the North Pacific will no longer be an economic undertaking in four to ten years' time.

It is not so much the problem of moving or not moving the abstention line that is the question. It is rather the validity of the philosophy supporting the line that is debatable. The United States has used many arguments to strengthen its position. Perhaps the one that has won most international recognition has been that of the "special interest" of the coastal state in fishery conservation policy. The two concepts of abstention, and special interest of the coastal state, are, however, not strictly connected. Even if the arguments for the validity of the "American property" claim are accepted, the demands for the 15 degree shift westwards of the abstention line are founded on assertions that have limited support from scientific data. The crux of the matter lies in the interpretation of the protocol of the convention.

In 1940, Gregory observed that "allowing extra-territorial exploitation of the North Pacific reserves was distasteful not only to capital

[12] Allen (1956): 22.
[13] *American Journal of International Law* (1957): Supplement, 223 et seq.
[14] McLeod (1958): 134.

and labour interests but to the whole country." [15] Behind this is the concept that the Alaska-spawned salmon are distinctly a domestic resource, a concept which forms the basis of the American fishery interests' view in the dispute.

The second part of the Truman Proclamation of 1945 declared an extension of United States' interests over the contiguous coastal seas for the purpose of, among other things, effecting fishery conservation policy, on an agreement basis with other countries if necessary. On the presupposition that salmon do not migrate westwards outside the continental shelf, they could, for all practical purposes, be called an American resource. However, research shows that the salmon migrate far beyond the limits of the immediate coastal zone.

After the Japanese "scare" in the 1930s, effective assertion of exclusive United States and Canadian rights and effective instruments to carry them out were called for as an assurance to the fishing and conservation interests. The I.N.P.F.C. was to have been the effective instrument. It was to ensure the reciprocity or the equitability between Asian and American interests determined by origin of the resource as well as to stop "the invasion of the other fellow's *natural* fishing grounds." [16]

Two main lines of policy are being pursued at the moment, one direct and the other indirect. Within the terms of the I.N.P.F.C. the Japanese are being asked to suspend fishing in the area of intermingling where North American salmon occur in significant proportions. Indirectly the vested interests are attempting to force legislation through Congress that would bring pressure to bear on Japanese fishing activities through economic sanctions, such as banning imports from Japan of canned fish. There are also attempts to use organized labour to take action such as refusing to unload goods from Japan at the port of entry into the United States.

The United States Government agencies can adopt various policies. The F.W.S. is legally bound to reduce fishing activity by United States citizens in accordance with its commitment to its conservation policy. The United States Department of State can only present such facts as depletion and economic hardship to the Japanese, for the Japanese Government has exclusive power over her vessels on the high seas. At first glance it is difficult to see what the exact United States policy is, because there is considerable internal conflict between interested parties. The government policy is clear, but that of other interested parties is not. The salmon-fishing industry has stated that it "will not make any more sacrifices for the benefit of the Japanese." [17] It believes

[15] Gregory (1940): 412.
[16] Allen (1935): 560.
[17] *Pacific Fisherman* (1959): 7.

that the F.W.S. must provide not only minimum escapement, but also benefits to United States fishermen.

In 1938 Bingham wrote, "The future peace and security of the United States is our policy. It is the protection of our interests in our coastal fisheries off the Pacific coast damaging invasion and foreign use." [18] In 21 years this point of view has not changed.

THE RELATIVE STANDING OF THE TWO CASES

The reports of the various sub-committees to the Committee on Biology and Research on the Progress of Research on the Problems raised by the Protocol of the I.N.P.F.C. contain the best statement on current expert opinion of all parties to the convention. The Committee's report to the 1958 Meeting of the I.N.P.F.C. in Tokyo provides the latest statement. [19]

The proposed fields of study agreed upon at the first meeting of the I.N.P.F.C. in 1954 were: (1) the distribution of salmon on the high seas; (2) the use of various techniques to distinguish origin; (3) the tagging of salmon to obtain direct evidence of movement; and (4) oceanographic background study for this salmon distribution and movement data. At the 1957 meeting, the zone of intermingling was delimited as spreading over about 30 degrees of longitude between 170 degrees East and 160 degrees West. In this large area there is considerable difficulty in observing the distribution of salmon by their origin. The evidence shows that each stock may vary from year to year in distribution and size. The present research programme leaves many gaps, and it is impossible to describe the high seas distribution of all the important races quantitatively and qualitatively. Although the distribution of salmon in 1956 and 1957 prove the year to year variation, they do not contradict some over-all general conclusions which can be made.

Tagged red salmon of American origin have been found to predominate over Asian-spawned salmon as far as 175 degrees East and to exist as far as 170 degrees East; yet, Asian parasite characteristics have been found as far east as 170 degrees West. Within the intermingling zone there is a definite north-south apportionment, with American-spawned salmon predominating in the Bering Sea, and Asian south of the Aleutians. However, "the dynamic rather than the static nature of the distribution of red salmon is emphasized." So far any quantitative conclusions on pink salmon are impossible. Marked intra- and inter-seasonal fluctuations exist in number and distribution. No research work on chum salmon had been carried out prior to 1954. After three years of intensive research by tagging and scale ana-

[18] Bingham (1938).
[19] I.N.P.F.C. (1959).

lysis, a conclusion that the centre of the intermingling zone falls about 175 degrees West, with a 15 degree spread on either side, can be made. However, measurement of intermingling within the zone in terms of assessed proportions is still quite vague.

Riesenfeld wrote that "in the Law of the Sea national egotism, rash generalisations, insufficient consideration of basic questions have caused more conflicts and uncertainties than in any other aspect of International Law. [20] The present conflict over salmon exploitation in the North Pacific is well illustrated by this statement. Both sides have pursued increasingly incompatible policies. The motives behind these policies have often been influenced by chauvinism and local self-interest, and by political considerations not directly related to the problem in question, rather than by notions of equity.

At the extreme, the fishery interests interpret the United States' case as founded on the premise that she has property rights over the salmon, and relate this to a policy of exclusive exploitation based on origin. Japan, of course, does not recognize this in practice. Hence many arguments are not founded on common ground. By municipal law involving conservation measures, and by such policy as the terms of the I.N.P.F.C., the United States has passed legislation in an attempt to achieve her goal of exclusive rights to exploitation. However, municipal legislation has been flexible, whereas the terms of the I.N.P.F.C. have not. The United States has thus tried to find scientific evidence to substantiate its legislative measures.

More logically, legislation and exploitation should be in the light of scientific evidence because the mass-exploitation has a scientific base. In all fairness, however, it must be pointed out that the present illogicality of the line 175 degrees West, although due to the lack of proper scientific evidence at the time, cannot really be blamed on its creators as it was supposed to be a temporary measure to meet immediate demands. Rash generalizations on both sides have led to serious misconceptions. The Japanese claim that there is no conclusive scientific evidence which related the drop in runs of Bristol Bay salmon to Japanese fishing of salmon on the high seas (Fig. 2) and that, moreover, there is no evidence that the Japanese are catching immature salmon or that the small mesh nets used by the Japanese kill or injure young salmon. The Japanese maintain that the need for the stringent conservation measures in Bristol Bay is a result of the coincidence of a cyclical low with an unusual limited escapement (Fig. 3) in the two main years, 1954 and 1955, in which the 1959 run was spawned. However, it has been found that about one per cent of the salmon running in Bristol Bay in 1958 had gill-net marks. Even so, the questions remain: how many injured salmon die before reaching

[20] Riesenfeld (1942): ix.

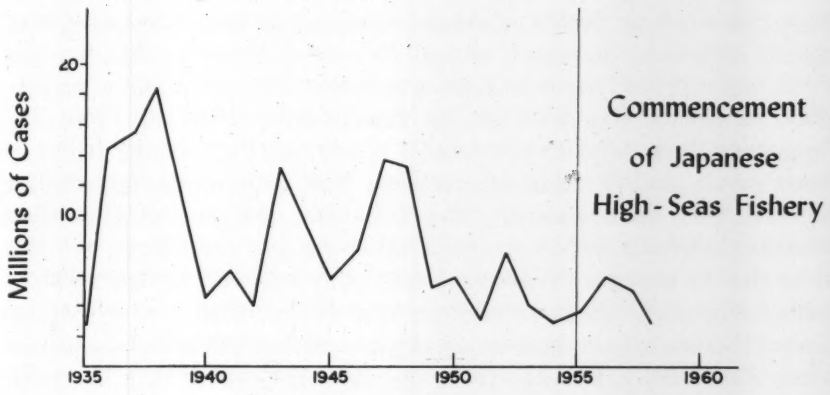

Fig. 2. Bristol Bay Red Salmon Packs.

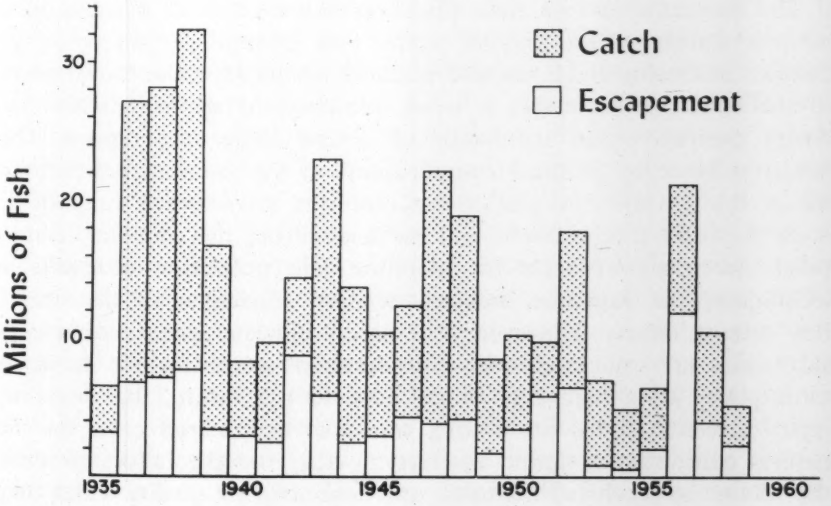

Fig. 3. Red Salmon Run in Bristol Bay.

Bristol Bay, and how many of the injured salmon that died, would die anyway due to other agents contributing to the "natural mortality" rate.

Professor M. Uda, of the Tokyo University of Fisheries, said in the spring of 1959: "It has been prematurely supposed by some that the main cause (of the decline of Alaska-spawned salmon) was over-fishing by the Japanese high-seas salmon fisheries. However, the declining trend began before Japanese high-seas fishing. The peaks in the sockeye pack in Bristol Bay were in the decade from 1930 to 1940. The fluctuation in natural environmental conditions such as the falling of water levels and freezing of spawning beds due to climatic change, together with deforestation, water pollution, dam obstructions, effect of natural enemies, predators, etc., and changes in survival, or mortality rates due to changes in ocean climate, may be mainly responsible for such a broad change in sub-Arctic waters." [21] Fisheries experts in the United States are in general agreement with Professor Uda's statement. Dr William F. Thompson, one-time Director of the University of Washington's Fisheries Research Institute, has stated, " . . . the (United States fishing) industry must not make the mistake of trying to remedy by law something that is a natural occurrence." [22] Obviously a distinction must be made between two trends. There is a definite over-all reduction in salmon runs for which the Japanese cannot be held responsible. However, a yearly fluctuation can also be observed.

The Japanese operate their high-seas salmon fishing industry in a manner similar to the way in which they operate several other industries producing goods deemed essential by the Japanese Government to the country's economy. It is an administered non-competitive industry entered within the hands of several large corporations. The industry, beset by political complications in the international field in which the government participates, receives government support. It is at the same time efficient and inefficient from the economic standpoint. In terms of scale of operation and utilization of available techniques, the Japanese industry is more efficient than the Bristol Bay salmon fishery. However, it is hardly efficient when certain considerations are examined. Such considerations would include its short-term policy of a high rate of discount to the future, the increased input necessitated by substituting transport and search costs for the natural concentration found at river mouths, and the failure to allow the salmon to reach full maturity, and hence highest quality which they attain as they begin to run upstream from the open sea. Return per unit effort, if measured by number of salmon per unit of gear fished, is far lower on the high seas where salmon are scattered, than in

[21] Uda (1959): 8-9.
[22] *University of Washington Daily*, 8 April, 1954.

Bristol Bay where they are schooled. On the high seas twenty-five men and a large boat must fish six to eight miles of net to equal the daily catch of two men in an open skiff using 150 fathoms of net. These questions of technical efficiency and high returns must be considered in the light of short-term exploitation and sacrifice of quality.

The United States' industry, on the other hand, has not been able to use optimum methods of exploitation because conservation legislation has been against this. Fishing techniques have become anachronistic. In 1939, when restrictions were not as severe as now, Deloach stated that " . . . such restrictions . . . serve to reduce the available supply for market purposes as well as to forestall wasteful use of the resource." [23] Up to the early 1950s, regulations were still severe in terms of legislation against more efficient techniques. The tendency has been for the F.W.S. to maintain a technical *status quo* in this manner. There have been various pressures behind such a policy. Ostensibly the desire for the conservation of the resource is fundamental. However, there are other factors, such as the vested interests of the boat owners, and the aspect of the asserted social benefit to the Alaskan native. Some type of benefit/cost analysis would be needed to gauge the validity of the last mentioned factor. There has been heavy investment in the industry to offset the lack of economies brought about by these inefficiencies. However, for the last 20 years, runs of salmon have been diminishing, hence productivity has further dropped. The great feature of salmon fishing is the lack of reliable prediction in terms of quantity, quality and time of species. Obviously, despite the factor of concentration, for the immobile site of the Alaskan industry this unpredictability is going to have a greater effect than for the mobile high-seas operation of the Japanese. This uncertainty means great risk. Up to the early 1920s the small cannery, typical of a risk industry, accounted for the major part of the pack. However, the tendency since then has been towards economies of scale by vertical integration, as the smaller canneries began to suffer competition from under-pricing by the bigger companies. As long as the runs did not deteriorate appreciably this was sound economics, and productivity increased. However, with progressive decreases in runs the catch dropped quickly below threshold requirements. The unit cost of the salmon has thus increased, giving the more cheaply produced Japanese article a comparative advantage and a strong competitive position in the American market. In fact, despite the low productivity per worker (or per capita unit in gear), caused by the need for search and large area covered by nets, the Japanese can put a lower cost per unit commodity on the American market due to other relative costs of factor inputs in the production process. Primarily lower wages per

[23] DeLoach (1939): 39.

worker in the Japanese industry enable it to achieve comparable labour costs to the American industry even though the Japanese use more men per salmon catch per unit of time. Secondly the Japanese government subsidises the industry in technical improvement as compared to government restraint in the United States' policy. These two factors would seem to explain the superior competitive position of the Japanese despite the natural advantage of concentration the Alaskan industry enjoys. Logically, then it would seem that if the United States' policy toward Bristol Bay salmon fishing were changed to one of government subsidies for technical improvement plus restricted entry into the market, the present industry would lower costs of salmon catch, and consequently lower prices of the commodity. This restriction would essentially mean the adoption of a monopoly operation of the industry after the Japanese style. The United States monopoly would never get out of hand as long as Japanese salmon were not restricted from the American market. There is one other important factor which must be considered. Because of the present nature of the resource, its availability rather than the volume of the market might ultimately set the limit.

The pressure for a solution to this international problem is essentially desired from the use or value both parties see in the resource. Therefore a solution to the economics of the salmon business in each country is fundamental in perpetuating the resource.

At the Law of the Sea Conference in Geneva 1958, the United States' case probably gained a little on the Japanese policy in terms of world opinion. The abstention principle found support, conservation was declared the duty of all nations, and the special interests of the coastal state were recognised. The convention must be ratified, and this will be binding only on the states accepting the obligations. Hence, regional and special organisations must continue to tackle conservation problems.

There is need for a permanent solution to the problem, a solution which must come through diplomacy and international law. However, there are many problems to be overcome before arriving at any agreement. Under the terms of the I.N.P.F.C., if any disagreements should arise in connection with the conclusions of research work, an independent committee is to decide on the recommendations to be made.[24] As Japan has never recognised the United States property claim, there is a question of the "spirit and intent' of the two disputants. Not only are there differences over the interpretation of the protocol of the I.N.P.F.C. but there are also varying opinions regarding the statistical inference of the data collected in salmon research. The accumulated scientific evidence since 1954 shows that disagreements will increase

[24] United Nations (1955): 47.

as the data mount. Complications and intricacies, unimagined in 1952, are becoming more evident as the sum of Canadian, American and Japanese data is brought out annually at the I.N.P.F.C. meetings. At the same time, any independent committee would be faced with so many alternatives that an objective solution based solely on scientific data will probably be impossible. Diplomatic compromise would then probably be necessary to settle the issue. Unilateral action can be ruled out as a solution, for it can scarcely be the basis of a fundamental and equitable solution of the fisheries problem. The United States realises that any policy of extending territorial jurisdiction can be a two-edged sword. Salmon fisheries are not the only important fisheries of the United States. The tuna-fishing industry of California finds the United States in the role of the high-seas state, and there is regional pressure from California against any national policy which would adversely affect the vested interests of the Californian high-seas tuna fleet.

The Canadians act as independent observers at the I.N.P.F.C. meetings. As they are satisfied that no salmon spawned in Canadian streams cross the 175 degree West line at any time, the Canadians can afford to be neutral. The Canadians state that it is not just a case of picking up the abstention line and moving it a little westwards, as the United States demands. They suggest that several new lines must be drawn to divide the stocks of salmon by species determined by an equal-ration proportion in terms of numbers of each species. These lines would have to vary from season to season. If such a solution were to be founded on scientific evidence in the terms that the I.N.P.F.C. demands, then it could only take place when and if sound and conclusive means of predicting salmon movement are developed. So far there is a lack of sufficient evidence for conclusive statements of any fundamental nature. Interpretation of data presently available varies, and allows for no conclusive proof of determinant factors. A mutually satisfactory line based on averages of migration extents seems a long way.

Japanese and American policies are at opposite poles. Even with some flexibility of either policy, there seems little possibility of a solution coming through the efforts of the contending national and sectional parties. There is a legal deadlock at the international level and disagreement on the interpretation of scientific data. However, diplomacy may yet find a way.

From this study of the conflict over the utilisation of the natural resource several features come to light: (1) the limitations and possible dangers of an exclusive fishery pact covering large areas of the high seas; (2) the economic need of Japan to maintain this valuable export at its present level; (3) the basic difference between the economics of the Japanese and American salmon fishing organisations; (4) the basic contrasts in attitudes between Japan on one side, and the two

principal "coastal" states, the United States and the Soviet Union, on the other, over the depletion and exploitation of salmon stocks; and (5) the confused state of international law relating to the freedom of the high seas and fishing rights.

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The Pakistan Cotton Industry

J. W. MACNAB

A characteristic of newly emergent nations is the desire to achieve industrial independence. Such nations usually have surplus labour which industry can absorb and many produce raw materials which in the past have been manufactured elsewhere. Initially, outside of the Communist block, industrial efforts are concentrated on the output of consumer goods. It is not until industrialisation has proceeded some distance that more emphasis becomes placed on the production of capital goods. [1]

This typical pattern has been followed in Pakistan. At Partition, in 1947, Pakistan was a producer of agricultural and animal products which formed the basis for a large part of the major industries of the Indian sub-continent. Few factories were located within the new boundaries of Pakistan and there was thus an urgent need to create within the new state industries to utilise the indigenous raw materials. Consumer goods industries, particularly food and textile manufacturing, were most popular with private investors as the technical knowledge necessary for their establishment was provided by refugees who had migrated from similar industries in India. Manufacturing of consumer goods thus became dominant immediately after Partition and its lead continues.

The efforts of the State have been directed to establishing those basic industries neglected by the private sector, in particular industries producing capital goods. To this end, the Pakistan Industrial Development Corporation was created in 1952. The industries it developed included jute, paper and board mills, fertiliser factories, and heavy engineering, ship-building, heavy chemicals, and iron and steel plants. Once under way, many of the plants were transferred to private ownership, but the State retained certain essential industries such as hydro-electric plants. State enterprise has taken precedence over private enterprise especially in the use of the limited foreign exchange so that development in the private sector has sometimes been hampered. Nevertheless, the recognition of the separate and interdependent roles of state and private enterprise and their successful marriage has been one of Pakistan's greatest achievements.

[1] United Nations (1958): 10.

J. W. Macnab is Lecturer in Geography at the Victoria University of Wellington.

This paper is, of necessity, restricted to the study of one industry, the cotton industry. This industry, the most successful undertaking in the private sector, has been chosen for an analysis of its development problems illustrates the difficulties facing Pakistan in the post-Partition decade.

At Partition, out of a variety of promising industrial enterprises open to private investors, the cotton industry was their first choice. This is not unusual. In both Britain and Japan it was one of the first factory industries initiated because of the simple technological processes involved. Other factors contributed to the popularity of the cotton industry. Technicians who had fled from the Indian mills were available. Pakistan produced 40 per cent of the raw cotton crop of undivided India yet had less than five per cent of the cotton textile mills. [2] The cotton industry too, has low capital demands, the pulp and paper industries in contrast, requiring more than five times as much capital per employee. [3] Clothing is the second basic need of a people and for Pakistan's climate, cotton clothing is most suitable, consequently there was an assured market. Development in this industry was therefore rapid and spectacular.

GROWING THE CROP

The 'Cotton Belt' in West Pakistan is a well-defined strip bordering the Indus and its tributaries (Fig. 1) an area in which cotton has been grown for at least 4,000 years. As cotton is an irrigated crop, its greatest acreage is in the irrigated areas of the former Sind and Punjab provinces and in the former Bhawalpur and Khaipur States. With the completion of irrigation schemes in the doab between the Indus and the Jehlum it can be expected that the cotton belt will extend westward into these newly irrigated tracts. In 1957-8 cotton was grown as a summer crop on 3.59 million acres only being exceeded by the chief winter crop wheat grown on 11.71 million acres.

The quality of raw cotton depends on the length, strength and colour of the staple and the indigenous (desi) varieties with short staples of $\frac{3}{8}$ to $\frac{5}{8}$ inch are only suitable for spinning into coarse yarn or for mixing with wool. No deliberate improvement of the cotton plant had been undertaken in Pakistan until the introduction of American seed in 1914. American type cottons, with their longer staples of $\frac{7}{8}$ to $1\frac{1}{8}$ inch, can be spun into finer yarn and are consequently in greater demand both at home and overseas. Efficient seed multiplication and distribution schemes have been in operation for over 30 years [4] so that in 1959, 86 per cent of the area under cotton was planted to American

[2] Vakil (1950): 35.
[3] United Nations (1958): 10.
[4] Pakistan Government (1952A): 24.

Fig. 1. West Pakistan Cotton 1958-9

Acreage. Total 3,253,774 acres. American varieties 2,796,793; Desi varieties 456,981 acres.

Production. Production in bales of 392 lbs. each. Total 1,529,203. American varieties 1,370,011; Desi varieties 159,192.

varieties which yielded 90 per cent [5] of the total production. Yields from the two types of cotton were significantly different. American type cotton averaged 192 pounds of lint per acre and desi varieties 136 pounds of lint per acre. These yields are low by world standards. Egypt, a high producer, has average yields of 470 pounds per acre. [6]

[5] Personal Communication, Pakistan Ministry of Agriculture (1960).
[6] Commonwealth Economic Committee (1959): 56.

Cultivation practices are generally primitive. One authority recommended [7] that a new variety of cotton be sown in rows two and a half feet apart (broadcast sowing is still common) and that nitrogenous fertilizer be applied at the rate of 50 pounds per acre. Despite acknowledgement that fertilizer greatly increases yields, in the early 1950s less than one pound of fertilizer was used per acre. Japan in contrast, was using 60 pounds per acre. The completion of a fertilizer factory at Daudkhel with its annual capacity of 50,000 tons will help to rectify the position, but if the whole output was applied to cotton fields it would still only provide 30 pounds per acre. Another factory, to produce 160,000 tons of fertilizer per annum, is under construction at Multan but more production is still required.

PROCESSING THE CROP

Ginning

From the farms the cotton is packed into loose bales each weighing 200 pounds, and transported by camel, bullock cart, or lorry to the ginning factory which is usually located alongside transport routes within the growing area. Much depends on the efficiency of the ginning; the quality and value of the lint is reduced by carelessness and by poor equipment. In an efficient factory, which was inspected by the writer at Mirpur Khas in Sind, the raw cotton was spread on to concrete sorting floors where women tediously picked out the more obvious dirt, twigs and unripened bolls before it was carried into the factory to be given its first mechanical cleaning. Such meticulous attention is rare. Dirt is often not removed and becomes pressed into the lint. Precleaning equipment is either non-existent or in bad order. Intentional adulteration is also practised, desi cotton is mixed with American varieties and endeavours made to sell the whole as high quality cotton.

It is recognised that efficiency in the ginning industry has decreased since Independence. [8] Most ginning factories were the property of Hindus who had fled the country. This evacuee property was, until recently, rented on a short-term basis. There was thus no incentive to maintain or improve the equipment, and deterioration was rapid. The total number of roller gins in 1959 was 11,695 and of saw gins 482 which according to some estimates is in excess of requirements. Roller gins are more popular than saw gins in Pakistan but this is not so overseas. In the United States 90 per cent of the crop is processed by saw gins which produce a cleaner, longer and stronger thread. But the saw gin is more complicated than the roller gin and if

[7] Khan (1959): 39.
[8] Afzal (1959): 11.

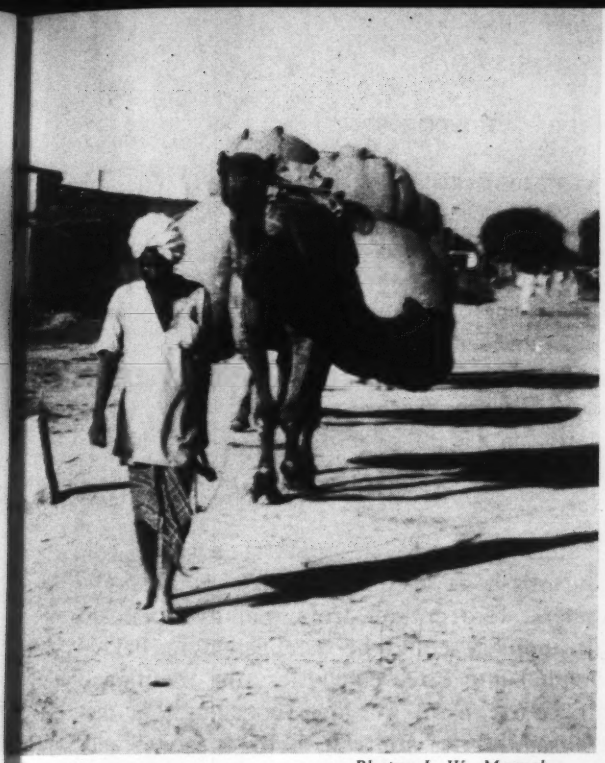

Fig. 2. Camel carrying 200 lb. bales of raw cotton to the ginning factory.

Fig. 3. Weighing, grading and recording the raw cotton in the yard of the ginning factory at Mirpurkhas, in Sind.

Photo: J. W. Macnab

Photo: J. W. Macnab

badly set, as is often the case in Pakistan, is capable of doing immense damage to the fibres. Today lack of technicians, rather than wilful neglect, appears to be the greatest obstacle to efficiency in the industry. Existing units are however being modernised and new units are being established in areas where cotton growing is expanding, particularly in the Thal and in Lower Sind.

From the ginning factory the raw cotton is conveyed to the Pakistani mills or to Karachi for export. Mills may process the cotton up to the finished cloth or produce yarn for use in weaving mills or on handlooms.

The Handloom Industry

The ancient handloom industry played its greatest part in the economy of the industry during the transitional period of the post-Partition years when consumers were cut off from manufacturers in India and before large-scale industry could be established in Pakistan. This industry can be divided into three categories: the traditional village handlooms producing coarse cloth for local consumption; the handlooms producing specialised fabrics for sale both at home and overseas; and the handlooms operated in small factories [9]

Since Partition, handlooms grouped in factories have become dominant and weaving has become an urban rather than a rural occupation. In Karachi it was not uncommon in the 1950s to see a small factory established on the footpath of a main thoroughfare, with refugees living in squalor beside the looms. This atypical development in urban areas took place when large numbers of weavers migrated from India at Partition. Their re-settlement was unorganised and they established themselves wherever they could. Cities and towns offered them facilities for credit, raw materials, and markets, facilities which were not available in the villages. A small class of entrepreneurs grew up and although some of the factories were well managed, most were badly organised and badly constructed. There was the social blot of exploited labour; workers were paid low wages, they had no security of employment and working conditions were usually deplorable. Cotton textiles were manufactured on 85 per cent of the handlooms with an average daily output of nine yards of cloth per loom. Initially, supplies of suitable cotton yarn were short and the Government permitted unrestricted imports. Though this gave some assistance the removal at the same time of restrictions on the importation of cotton cloth opened the way for unwelcome competition from cheap Japanese machine-made cloth. The Korean War provided a temporary stimulus and the greatest expansion in the industry took place at that time. It is claimed that handlooms then supplied 40 per cent of the country's requirements of cloth.

[9] Second Five Year Plan (1960): 237.

Photo: J. W. Macnab

Fig. 4. A handloom 'factory' established by refugees on the pavement of a main street in Karachi.

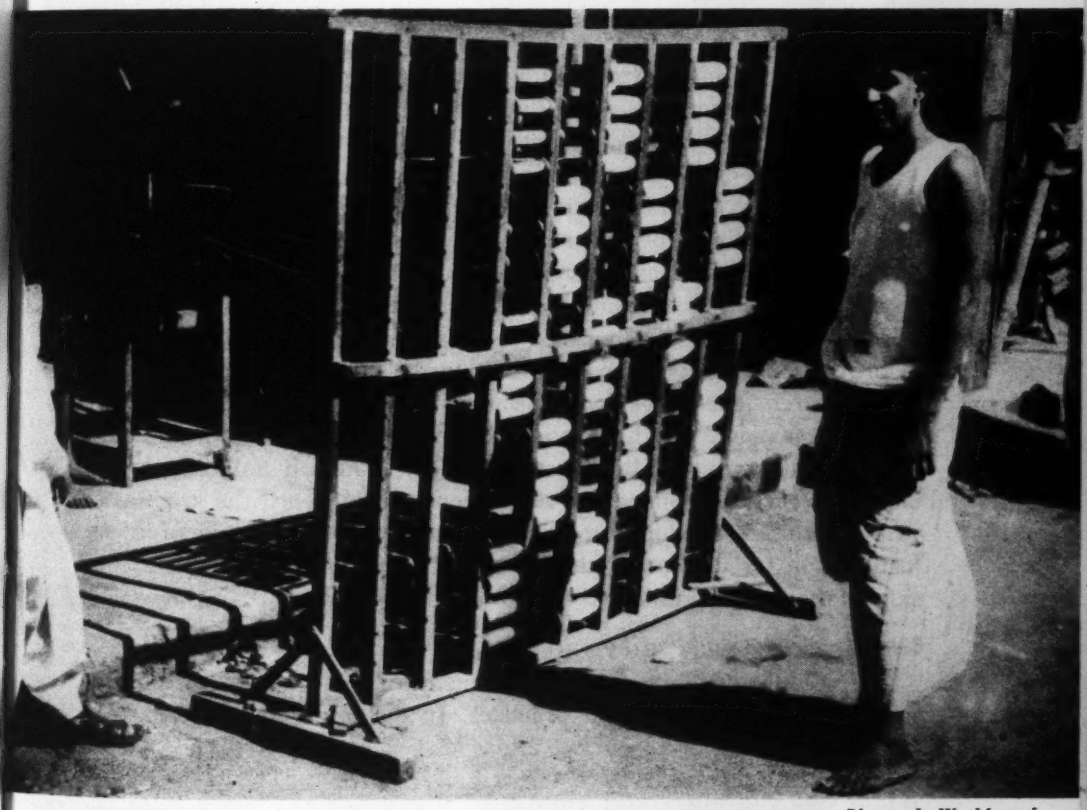

Photo: J. W. Macnab

Fig. 5. Threading up a handloom in a poorly illuminated pavement 'factory'.

Since 1953 the importance of the handloom industry has declined, in part due to poor standardisation of quality and in part due to the increasing competition from the indigenous large-scale industry. Independent weavers were gradually forced by economic necessity to become contract workers or wage earners in the handloom factories. Because of their urban location few had subsidiary employment and the average wage of Rs. 40 per month provided only a bare existence. The Fact Finding Committee on Handlooms considered that neither the Provincial nor Central Governments had given the industry as much protection, assistance and guidance as it deserved considering the numbers dependent upon it. The Committee reported that in Bahawalpur out of 3,000 looms operating in 1953 only 700 were working in March 1955. In all West Pakistan in 1955 out of the 234,418 looms remaining 36.8 per cent were idle. [10] Yet it was estimated that about a million people were directly supported by the industry and almost another half million were in subsidiary industries.

This small industry was seriously handicapped by production methods that were outmoded and inefficient. Finance was lacking, there were difficulties in obtaining suitable yarn at cheap prices, there were poor marketing facilities and there was the ever-increasing competition from large-scale factories. Investment per worker was low but investment per unit of production was so high as to make handlooms non-competitive with power-operated looms.

The main remedy for the handloom industry seemed to be re-organisation into co-operatives similar to those operated in Japan. [11] These co-operatives jointly owned and managed by the weavers would be responsible for purchasing supplies, carrying out certain phases of production such as finishing, and would market the finished cloth. The Small Industries Corporation was established by the State in 1956 to provide similar assistance. In addition the Corporation could undertake research, encourage mechanisation and grant financial aid. However it was noted in the Second Five year Plan that the ambitious support programme of the First Five Year Plan had not been implemented. [12] The second Plan recommended that only the traditional village industry be supported, but it found little economic or social justification for continuing the outmoded handloom factories and considered that these should give way to power looms. [13]

Large-scale Manufacturing

Initial difficulties in the establishment of a local textile industry were imposed by traditional practices. In the past Moslems had been

[10] Pakistan Government (1956A): 17.
[11] First Five Year Plan (1956): 310.
[12] Second Five Year Plan (1960): 221.
[13] Second Five Year Plan (1960): 237.

traders not industrialists and they preferred family partnerships to joint stock companies. However, these difficulties were overcome. Great inducements to private investors were offered by the Government; industrial estates were created where sites and services were made available, and the State encouraged or created basic industries such as cement factories to provide the raw materials for buildings. Taxation concessions were generous and those who entered the cotton industry reaped large rewards. It was the rare organisation that did not recoup its capital in less than five years.

The distribution and type of cotton mills are shown in Table 1.

TABLE 1

Type and Distribution of Cotton Mills
(Position at 30th June, 1959)

Areas	Mills Installed				Spindles Installed	Looms Installed
	Composite	Purely Spinning	Purely Weaving	Total		
Karachi:						
Karachi	23	7	—	30	604,852	9,816
West Pakistan:						
Lyallpur	7	1	1	9	293,332	5,565
Multan	1	4	—	5	158,504	1,520
Hyderabad	6	4	—	10	116,080	1,249
Rawalpindi	2	1	—	3	66,280	919
Thal	2	—	—	2	51,344	817
Peshawar	3	—	—	3	50,100	852
Khairpur	3	—	—	3	44,620	780
Rahimyar Khan	1	—	—	1	36,440	501
Lahore	3	—	1	4	36,232	607
Okara	1	—	—	1	36,212	1,290
Jehlum	1	—	—	1	25,184	720
Sargodha	1	—	—	1	34,984	500
Khanpur	1	—	—	1	15,200	300
Quetta	1	—	—	1	12,400	250
Haripur	—	1	—	1	10,000	—
East Pakistan:						
Dacca	7	5	—	12	246,606	2,525
Chittagong	2	2	—	4	67,412	246
Kushtia	1	—	—	1	19,288	537
Bogra	1	—	—	1	12,400	—
Khulna	—	—	1	1	—	110
TOTAL	67	25	3	95	1,927,470	29,104

Source: Pakistan Government (1959)

Factories, equipped with machinery from Japan, the United Kingdom and West Germany, have tended to be concentrated near a few large towns. Karachi became the leading centre because of the advantages of the port, the special facilities of the industrial estates, the close proximity of the centre of administration and the presence of a large business class who settled there on migration from India. On purely economic grounds, new capacity should be installed where costs of production and transport are low but political and parochial demands have led to the establishment of factories as far away as East Pakistan even though these mills have to rely on cotton grown in the West.

The 17 mills with 177,148 spindles and 4,824 looms of 1947 have increased to the 95 mills (19 in East Pakistan) with 1,927,470 spindles and 29,104 looms of 1959 processing some 200,000 tons of cotton annually. Characteristic of the cotton industry in Pakistan are the composite mills which spin, weave and finish the cotton in the one factory. In 1947 all were composite and in 1959 in West Pakistan 56 were composite, 18 were spinning and two were weaving mills. This is in contrast to the English pattern where separate factories spin, weave and finish the cotton.

Some 200,000 workers are directly employed in the cotton mills together with 300,000 in subsidiary and auxiliary industries.[14] At first local operators were trained by the foreigners responsible for installing the machinery. Today training, not only of the operators but also of the managers, is often rudimentary. The need for technical education is recognised by both State and industry and great efforts are being made to overcome both the quantitative and the qualitative shortage but education facilities at all levels are inadequate. Finance, buildings and teachers are in short supply. For example it is estimated that in the next five years 70,000 primary teachers and 14,780 secondary teachers will be required. However training for skilled factory personnel can often be provided on the job. With strong village and family loyalties, employment in a factory is often restricted to kinsfolk of those already employed. The potential employees are trained by their relations, often without the knowledge of and at no expense to the company, as such training can lead to a permanent position and to a measure of security.

Industrial development in Pakistan entailed a social as well as an economic revolution. The migration of workers from agriculture to industry has brought new urban concentrations and has given rise to large-scale problems of housing and sanitation. The social security provided by the extended family in an agricultural setting has been destroyed by the creation of nuclear family units in the cities. A large manpower reservoir prevents effective trade unions being established

[14] Personal Communication, The Cotton Board, Manchester (1960).

which could bargain for higher wages. There is as yet no fixed minimum wage and wages vary from plant to plant, but perhaps average Rs. 80 per month. Wages may be low by Western standards but not by local standards and wages are regular and there is some security. In the best factories medical, canteen and housing facilities may be provided with creche and educational facilities for the children. There are too, the beginnings of state social insurance in Pakistan with Workers' Compensation, employee's provident fund and maternity benefit schemes now provided for in Government legislation. Joint family security is giving way to State social security.

SIGNIFICANCE OF COTTON IN THE PAKISTAN ECONOMY

Manufacturing as a whole is still subsidiary to agriculture, but agriculture now depends heavily on indigenous industry for implements, fertilizers, power, transport and processing of agricultural products. Almost 40 per cent of the increase in national income during the First Five Year Plan period was contributed by industry. From 1950 to 1959 production in large-scale manufacturing industries increased five-fold. Textile industries accounted for almost half the industrial investment and employed more than one-third of all those engaged in large-scale industry.

The establishment of the textile industry has led to great savings of foreign exchange. Cotton cloth was the largest single import item in 1951-2 comprising some 18 per cent of all imports with cotton yarn accounting for a further 13 per cent, [15] at a total cost of some Rs. 625 million. The successful development of the cotton industry exceeded expectations and not only were home demands fulfilled with an annual production of 12 yards of cloth per capita but by 1956 there was a surplus available for export. In 1959-60 cotton piece goods were earning Rs. 52.2 million and cotton yarn Rs. 175.4 million [16] of overseas currency, approximately one-tenth of the foreign exchange earnings.

Exports of raw cotton are still important to Pakistan but as she produces only about five per cent of the world's cotton she can have little influence on world prices. In the past Pakistan has been adversely affected by the domestic policies of the larger producers. The United States in particular exerts a decisive influence on the world market especially on the medium staple type of cotton grown in Pakistan. [17] A domestic decision of that country to increase production can reduce the price that Pakistan receives for her raw cotton, and a stable price level cannot be guaranteed. With Pakistan now exporting textiles

[15] Pakistan Government (1952B): 13.
[16] Pakistan News Digest (Sept. 1960).
[17] Commonwealth Economic Commision (1958): 24.

as well as raw cotton there is a broadened basis of trade and this partially relieves her of dependence on a few economically important countries. The problem of finding new overseas markets is, of course, a major one.

A strong drive for overseas trade has been made but export potentials are limited. China, Taiwan, Hong Kong and South Korea have newly entered the export field and have to compete with the established traders of India, the United Kingdom and Japan. Even these countries are being affected by increasing competition and so serious is the glut in the market that advanced cotton textile exporting countries such as Japan, 'have increasingly switched over to the production of goods in strong demand, such as machine tools and electronic equipment.' [18] Without knowledge and experience Pakistan cannot at present compete in the field of fine fabrics, a market dominated by the United Kingdom and Japan, though recent aims have been to produce finer yarns for which there is a strong home demand. Total domestic demand is expected to rise to 14.5 yards per capita by 1965 and to maintain both domestic supplies and textile exports the Second Five Year Plan has as a target 2.5 million spindles, 200,000 of which are earmarked for the production of finer yarns.

Pakistan has some advantages: her machinery is new and modern, she is a producer of the raw material and consequently has no excise payments, and has low transport costs. There is still a demand for raw cotton on the export market and a higher standard of living at home would increase internal consumption.

Of basic importance to the development of the cotton industry has been Pakistan's three major needs: the need to process her limited raw materials to the greatest extent, the need to raise the standard of living of her people by providing full employment, and the need to save overseas exchange. The cotton industry was technically and politically easy to establish and consequently has dominated the post-Partition period. In its social aspects development has been painful but its importance reaches far deeper than the general raising of the national income. This was Pakistan's first venture into large-scale industry and the long term importance of its success and its implication for further economic development is greater than can ever be shown by production figures or financial statements.

[18] United Nations (1959): 73.

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The Asian and Pacific Scene

CHINA: THE DEMOGRAPHIC REVOLUTION

Throughout China's history flood and drought have caused untold suffering and, by drastically cutting back population, have maintained a precarious balance between man and food supply. Drought caused the greatest famines; the 1877-8 famine on the loess plateau resulted in between nine and thirteen million deaths, and was equalled by that of 1928 which caused three million deaths in Shensi alone. The 1931 Yangtse floods rendered twelve million homeless, those of 1935 affected fourteen million people. The classical checks to population growth have thus certainly operated at many points in China's history; their influence is reflected in past growth rates which between 1776 and 1850 averaged 0.63 per cent per annum, dropping to an average of 0.3 per cent between 1850 and 1953. (Ping-ti Ho, *Studies on the Population of China,* Cambridge, Mass., 1959, p. 277).

In the past, the impact of these natural calamities has always been greatly aggravated by wars, social disorders or the weakness of the central government. Today, by contrast, a strong central government, an efficient local administration and a boldly conceived policy of social and economic development are reducing and will eventually eliminate these 'catastrophic deterrents' to population growth. The social and political organisation of the last decade, and above all the development of the commune system, has made possible a vast programme of irrigation and river control and this programme is wiping out many of the old causes of poverty and insecurity. The events of 1959 and 1960, when the country was affected by unprecedented droughts and floods, showed that the Chinese are achieving a high degree of mastery over their environment and thus over their demographic future. The commune system provided at the same time the institutional framework for a nationwide attack on disease and poor hygiene; indeed, R. Hughes suggests 'that the greatest and most enduring achievements of the organised communes . . . will prove to have been recorded in these basic advances in public health and hygiene . . . ' He goes on: 'In theory, this development of medical care in Chinese villages need not have waited on the development of the commune. But, in practice, the communes came first: it is as though the harsh regimentation of life was a necessary discipline for the prolongation and protection of life. (*The Chinese Communes,* London, 1960, p. 71. See also views of visiting Western doctors cited by Felix Greene, *What's Really Happening in China,* San Francisco, 1960, pp. 11-13.)

The political and social revolutions in China have thus paved the way for a demographic revolution whose scale and implications are only now becoming apparent. Birth rates for the country as a whole have dropped slightly (from 37 per thousand in 1952 to 34 in 1957) but death rates dropped sharply (from 18 per thousand to 11). The decline in infantile mortality rates has been particularly marked; in Shanghai, for example, the rate dropped from 81 per thousand to 31 in four years; expectation of life at birth is now claimed to be 54 years (cf. India, 35 years in 1951.) All these features suggest a continuing high rate of absolute increase even if family sizes should decline, for the size of the contingents entering the reproductive age groups will increase for some years. Recent trends in China's population are summarised in the table below:

Growth of China's Population (Mainland only)

Year	Population	Increase over preceding year	
		Numbers	Percentage
1953	587.9 m.	13.1 m.	2.3
1954	601.7 m	13.8 m.	2.3
1955	614.6 m.	12.9 m.	2.2
1956	627.8 m.	13.1 m.	2.2
1957	649.5 m.	21.7 m.	3.4
1958	673.0 m.	23.5 m.	3.6

Source: S. Chandrasekhar, **China's Population,** Hong Kong, 1959, p. 55.

The immediate economic problem posed by this population growth is that of providing food for a population of some 700 million, increasing at a rate of over 20 millions a year. He observes 'It seems possible for China even to increase food production at a rate higher than that of her population growth for a limited number of years if advanced agricultural technology is widely introduced. But the long range prospect is bound to be far different. In the first place, her present population is already very large and even a moderate sustained growth will be a great strain on her agriculture. Secondly, more labour-intensive cultivation and introduction of advanced agricultural technology cannot in the long run prevent agriculture from reaching the point of diminishing returns.' In China, however, the success achieved in expanding food production confirms many experts in their view that, with agricultural techniques in a process of rapid transformation, they are very far from even approaching the point at which diminishing returns set in. Certainly, the scope for increasing output on the existing (or even a reduced) crop area is very large, while, from a long term viewpoint, there remains the possibility of pushing the agricultural frontier deeper into the arid and micro-thermal regions of the West and Northeast and of reclaiming for arable or tree cropping the uplands of Central and South China which were devastated by robber-farming in the seventeenth and eighteenth centuries. At the present, then, it is difficult to envisage a major food shortage as a limiting factor to population growth in the foreseeable future.

The problem of absorbing into the country's economy the increasingly large contingents entering the working age groups is more critical. The annual increase is estimated at four million during the First Five Year Plan, five million during the Second Five Year Plan and seven million during the Third Five Year Plan. The cities can absorb approximately one million industrial workers annually; the residue must be absorbed in the rural areas. Some commentators see the development of the commune system, with its massive investment of labour in major irrigation and flood control projects and its drive for widely dispersed industrialisation, as an attempt to cope with this problem. As Leo A. Orleans writes 'Almost simultaneously with the abandonment of the birth control policy came the creation of the Communes and the inauguration of the now famous 'great leap forward.' Whether the timing here was planned or fortuitous is not known, but the effects are indisputable. By utilising millions of men in numerous construction projects . . . an artificial labour shortage was created . . .' ('Birth Control: Reversal or Postponement,' *The China Quarterly*, No. 3, July-Sept. 1960, p. 65.)

Only very rough estimates of these new labour needs in the rural areas are available. Su Chung writes 'To double China's present grain and cotton output . . . at least 50 million more people will be needed . . . the amount of work involved (in water conservancy construction) would normally keep 30 million people busy

for a year.' (*Peking Review*, July 1, 1958, p. 9.) Both figures will, however, be significantly affected by mechanisation which, as Mao Tse-tung has said, is 'the fundamental way out for agriculture,' and under these circumstances the absorptive capacity of the countryside will depend increasingly on the progress of rural industrialisation. Developments in the last two years underline the critical need for an increase in the productivity of labour and for the continued diffusion of technical education if industrialisation and diversification are to make their maximum contribution. It may thus be argued that China's ambitious programme of technical education will play a major role in easing, if not actually solving, her population problem. A. Sauvy has said that 'an overpopulated country is an under-educated country' ('Evolution récente des idées sur le surpeuplement' in *Population*, Paris, June-July 1960, p. 481) and has shown how an increase in technical competence, by making possible an increasing diversification of the economy, can significantly ease the pressure of population. In a country such as China, where until recently virtually the entire population was illiterate and completely ignorant of any technical skills, his concept has an even greater relevance.

It is argued by some that the high rate of population growth makes it difficult for China to accumulate funds and for a country desperately striving to emerge from poverty and to modernise this is a pressing need. A writer in the *Peoples Daily* (Peking) quoted by Chandrasekhar (p. 24) expressed the view 'If the speed of our population growth slows down, improvements in the livelihood of our people will quicken correspondingly.' Other Chinese writers have claimed that 'Facts show the opposite. In 1952, 18.2 per cent of China's national income went into accumulation; it rose to 22.5 per cent in 1956 . . . Accumulation by peasants and co-ops is also rising. In the First Five Year Plan, the sum increased by 47 per cent . . .' However, it seems clear that the provision of consumer goods and of social services must, in the case of a country with a rapidly expanding population, absorb investments which might otherwise have been diverted to strengthening the heavy industry sector of the economy; the result will be a retarded pace of economic development. Comparative studies of the problems of other underdeveloped economies reveals the magnitude of the effort involved in achieving a steady rise in living levels in the face of increasing population; thus, L. Tabah shows that 'a 2 per cent annual increase in *per capita* consumption, in a country where the annual *per capita* income is under 100 dollars, amounts to a doubling of individual consumption in 35 years and in the case of a country with a high birthrate investment needs exceed 30 per cent of the national income during the first 25 years' (quoted in P. George, *Questions de la Géographie de la Population*, Paris, 1959).

The birth control campaign—or, as the Chinese prefer to call it, 'education movement'—appears to have been inspired by these considerations. Public discussion of the need for population control began in 1954, when Deputy Shao Li-tzu raised the problems before the People's Congress. He stressed that 'his plea for birth control had nothing to do with decadent, outmoded and reactionary Malthusian doctrines. (It) was based on the need for protecting and improving the health of hard-working Chinese mothers and affording better opportunities for their children.' (S. Chandrasekhar, *Contemporary China*, ed. E. S. Kirby, Vol. III, Hong Kong, 1960, p. 23.) By mid-1955 the official support of these ideas was indicated by Premier Chou En-lai's plea for 'appropriate control in respect of births.' The peak of the campaign was reached in March 1957 when a Birth Control Research Committee was set up 'to co-ordinate experience and research in contraception.' 'Birth control . . . and planned childbirth' said the Minister of Health, 'are actually indispensable to morality and the State's responsibility to the people.' Population control was to be achieved by contraception (120 million

sheaths were sold in 1957), by clinical abortion, by late marriage or by the sterilization of either partner and the more enthusiastic newspapers suggested targets for the campaign—a lowering of the urban birth rate by 30 per cent and of the rural birth rate by 20 per cent. Mass education campaigns in the cities, and pamphlets, contraceptives, and medical advice in the rural areas, spread the new ideas throughout China.

In early 1958 there was an abrupt change in policy. There was strong criticism of those, such as Professor Ma Yin-ch'u, who regarded the population problem as a barrier to economic progress and socialisation, and an increasing emphasis on the labour shortage. By the end of 1958 the official line—that a large population was an asset—was firmly re-established. Han Suyin discusses the change in policy and suggests that it was a response to the psychological and practical needs of the situation; that 'it is not correct to speak of China as having reversed its policy . . . what can be said is that the government is suspending judgement.' ('Birth Control in China—Recent Aspects,' *The Eugenics Review*, Vol. 52, No. 1, 1960, p. 20.) The psychological need for a re-examination of the situation arose from the necessity of considering peasant reactions. Any policy of family limitation might well suggest to the peasant 'that the future was insecure, that a famine was impending, since the government asked them to have fewer children! That meant the government was frightened there would not be enough food to go round. Panic of this kind in China is enough to paralyze the countryside, to set off extraordinary reactions and to sap the foundations of the order which the Chinese government was trying to achieve.' The practical basis for a re-evaluation of the situation lies in the fact that capital accumulation in China still depends on the labour of men's hands since machinery is not available and, in the transition period during which a technologically competent and scientifically educated peasantry emerges, all the ambitious plans for the remodelling of the country's economy demand heavy investments of man-power. This interpretation, it will be seen, is rather different from the interpretation of Leo Orleans cited above. Han Suyin sums up 'There is, therefore, no incentive to limit the family as a *necessity*; but there remains the incentive to limit the family as a *convenience* . . . With a higher standard of living, and since a large family *is* an inconvenience, the majority of China's people may demand family planning as a convenience, but at present this is still a minority.' She comments 'There are no such things as inflexible policies in China, at any time' and certainly population policy has shown, and is likely to continue to show, major shifts as Chinese planners attempt to co-ordinate the results of China's demographic revolution with Marxist teachings and the exigencies of their development plans.

KEITH BUCHANAN

THE ASIAN CITY: PROBLEMS AND PROSPECTS

The assertion that economic development is necessarily associated with increasing urbanisation has been widely accepted by economists. In the face of the seeming inevitability of this process the present piecemeal policy adopted by many Asian countries to ameliorate the economic, social and physical problems associated with urbanisation would appear to be the only logical course. Such an approach would say that, after all, difficulties of rapid urbanisation can be only partially solved. The overcrowding in slum conditions can in part be prevented by the creation of new housing areas, such as a Petaling Jaya or a Kebayoran; the rural in-migrants' problems of adjustment in the city can be partially alleviated by education, or community schemes; the economic problems of unemployment can be partially tackled by the creation of new industries. Such policies attack the symptoms but not the cause.

The possibility that the actual process of urbanisation could be slowed down, or at least substantially modified, while economic growth still continues, has scarcely been entertained by planners. It is for this reason that the UNESCO publication on urbanization in Asia is important (P. M. Hauser (Ed.), "Urbanization in Asia and the Far East," *Tensions and Technology Series*, UNESCO, Calcutta, 1957.) The volume suggests that the only way to solve these problems of urbanization is to control the process of urbanization, and thus strike at the very root of urban problems in Asia.

The problems of growing towns are more serious in Asia because, as Hauser points out, "Asia is over-urbanised in relation to its degree of economic development' (p.9). Yet Asia has only 13 per cent of its population in cities of 20,000 or more, making it the least urbanised continent in the world except for Africa. The reasons for this seeming over-urbanisation are twofold; the historical pattern of development, and the present–day desire of these Asian countries for economic growth.

The colonial period, characterized by declining village industries in competition with cheap imported goods of the colonial powers and increasing population pressure in rural areas, gave impetus to rural migration to the towns. At the same time the colonial economic framework led to the establishment of "one great metropolis, the primate city, a great city which dominates the urban situation" (p. 87). These parasitic cities were orientated primarily toward the contribution of services to the colonial power abroad and to the needs of the colonial and indigenous "elite" in the great city itself. Their occupational structures were consequently heavily weighted on the side of tertiary occupations, which provided little opportunity for the relatively unskilled rural in-migrants. These had no alternative except to enter fringe tertiary occupations, such as hawking, which were already overcrowded. Thus today there are more people in these large cities than in any other continent and the problems of urban Asia are very much the problems of the big city.

The period of post-war independence and the desire of the Asian countries for economic development has also emphasised this trend, for in most of these Asian countries economic development must be accomplished through industrialization. The building up of the consumer and heavy industrial sectors will only increase this trend to concentrate people. Here the UNESCO Report, while admitting that there is no possibility of avoiding industrialisation, suggests that there may be other economic alternatives for the ordering of economic activities in a less concentrated pattern. The sum total of this uneven process of urbanisation and ineffectual methods of coping with the problems which have arisen has been a situation in which "urban misery and rural poverty exist side by side, with the result that the city can hardly be called 'dynamic' as social historians of developed countries generally describe the process of urbanisation" (p. 10). In fact the city proves to be a drag on economic development as its immediate requirements involve much more investment than "long term and less productive projects in the immediate sense" (p. 8). Thus limited capital resources are wasted at the all-important initial stage of economic development.

If the UNESCO volume's chief value rests on its emphasis of the wider implications of the relationship of urbanisation and economic development in the unique Asian context, of scarcely less importance is its outline of the social, economic and physical problems of the Asian city.

Problems of Asian urbanisation fall into three broad groups: the economic problems of unemployment, unbalanced occupational structures, poverty, inequality of income; the social problems of the in-migrant, the effect of the

city in breaking down traditional social relationships and the resulting problems of delinquency; the physical problems of overcrowding in slum areas, of town planning, of providing adequate transport and recreational facilities. These problems have existed for some time, and are increasing. This is emphasised by four recent publications on urbanisation in Asia: *The Indonesian Town* — a collection of pre-war studies on urban areas in Indonesia; Bopegamage's ecological study of Delhi (*Delhi: A Study in Urban Sociology*, Bombay, 1957); R. P. Dore's human study of social change in one small ward of Tokyo city (*City Life in Japan, London*, 1958): and Kaye's microscopic statistical survey of people and their living conditions in the overcrowded heart of Singapore (*Upper Nanking Street, Singapore*, Singapore, 1960).

That these problems of urbanisation were present and growing during the pre-war colonial period, is well illustrated in the collection of essays edited by W. P. Wertheim ("The Indonesian Town," *Selected Studies on Indonesia*, Volume IV, The Haugue, 1958), and in particular the study of "The Living Conditions of Municipally Employed Coolies in Batavia in 1937" carried out by Netherlands East Indies Central Bureau of Statistics, which points to indebtness (63 per cent of wages going to landlords, and "warong" keepers in payment of debts), and poor living standards in substandard dwellings — and this amongst a regularly employed group (p. 223). Why these conditions were allowed to continue and why scant attention was paid to them is brought out strikingly in other essays. The editor notes in the foreword that amongst "the Dutch ruling group there was an instinctive aversion to the phenomena of urban growth" (p. v), and it was only from individuals such as Westerveld ("a man of pronounced Socialist convictions" p. ix) that any agitation to investigate the bad urban conditions arose. Even when the Dutch ruling classes did begin to pay some attention to these conditions one wonders if it was not for fear of nascent nationalism rather than humanitarianism. This contention is supported by Karsten's persuasive argument to provoke government interest in the bad conditions of Indonesian towns. In his essay on "Town Development in the Indies," he says that people who live in "disorderly and unfriendly towns will be encouraged in a tendency to social discontent and unruliness. Hence the degree of aesthetic harmony and beauty in the Indies towns, though above all important from the idealistic point of view, also has a very concrete, in fact almost a political significance, from the realistic point of view" (p. 55). But little was done to solve such problems. The reason is explained by Karsten in a later section. "If the upper social stratum, which is so much more powerful than the others, goes its own separate way and is only superficially bound to the town and the other population groups, is it anything but a matter of course that it has created really satisfactory housing and recreational facilities only for itself?" (p. 68).

During the colonial period little attention was paid to the question of urbanisation. Only since the war has field work really focussed on the investigation and suggestion of remedies for the problems of urbanisation. The contemporary studies cited all draw attention to the social problems, of which a most important section is the process of social change. Here both Hauser, in the UNESCO Report, and Dore warn of the danger of carrying over concepts formulated in the Western city. The Asian city dweller is far from being characterised by sophistication, objectivity, utilitarianism and rationalism. Rural and traditional values strongly persist and this is well illustrated by the clusters of almost rural villages which contrast with the gleaming white and many-storied buildings in a city such as Kuala Lumpur. But even if the

process of social change is slower than in the Western city it still goes on—women possess more freedom; 'arranged marriages' decline and there is an increasing importance of the emotional relationship between husband and wife; the large joint, extended families tend to break up and become smaller. In Upper Nanking Street 64 per cent of the people live in simple families, i.e. parents and children only (p. 43, Kaye). If the larger allegiance to clan and tribe is partially broken down by the individualism of the city, the neighbourliness of the Western city is not always built up to replace it (Kaye reports that very few Chinese in Upper Nanking know people outside the house they live in; p. 276). Bopegamage comments that caste still affects neighbourliness amongst Indians in Delhi (p. 98). In Japan, Dore reports a rather higher degree of neighbour co-operativeness.

Social change brings its problems of adjustment. Particularly prone to them are the in-migrants who form a high percentage of city population. For instance, in Tokyo 42 per cent of the population are born outside the city (p. 18, Dore). In the Upper Nanking Street study, 41 per cent of the inhabitants were born outside Singapore (p. 141, Kaye), and these figures can be repeated in most large cities of Asia. The in-migrant faced with a new urban situation — with new and unfamiliar ways of making a living, regular working hours, an absence of family living and a large number of impersonal contacts — frequently fails to make adjustments and waves of delinquency and crime result. Often the problems of this initial period are avoided by the tendency of the in-migrant to stay with relatives.

This pattern of social change and social disruption must be seen against the physical framework of intense over-crowding of a high percentage of the population in slum conditions in the heart of Asia's cities or in shack settlements on the outskirts, which contrast with the spacious houses of the upper class and the "quarter acre cult" of the newly emergent middle class. It is with the physical problems of the overcrowded slum areas that the majority of writers are concerned. Bopegamage gives a figure for the density of population in the heart of Delhi of over one thousand people per acre (p. 40), but his analysis of living conditions and standard of housing is too subjective. Barrington Kaye has analysed the living conditions in intricate detail; the Chinese families living in Upper Nanking Street are huddled in tiny cubicles (subdivisions of the upper portions of the shophouses) each averaging 103 square feet and occupied by three or four people. The rooms are poorly ventilated (33 per cent have no windows) and practically all the people share cooking, toilet and washing facilities. It is not surprising that social and health problems arise under such conditions and that neighbourliness is at a minimum. Unemployment, low incomes and indebtedness also persist.

To solve these problems Bopegamage envisages replanning of the city; the creation of satellite suburbs, the clearance of slum areas and the control of the physical framework. Dore stresses the need to understand and direct the process of social change, while Kay is content to present the statistics assuming that they speak for themselves. It is only the UNESCO study which suggests that the solution lies in overall planning rather than piecemeal engineering.

The UNESCO report points out that Asia has two distinct advantages which should aid such schemes of overall planning. First, modern technology "offers a wider range of possibilities for the region-wide distribution of population" (p. 29). For example, "there is available for industrialisation and spatial arrangement of plant and population in Asia electric power as well as steam power, so that cities can simultaneously, rather than sequentially, experience centrifugal and centripetal forces" (p. 90). Secondly, Asia "has the advantage of the increasing role of government and public responsibility in the planning and

the development process." With these two advantages Asia could well take positive steps to guide the process of urbanisation.

The success of any such scheme rests on two basic requirements. First, that there is knowledge of the nature of Asian urbanisation. It is here that the intuitiveness of Hauser's essay on "World and Asian Urbanisation in Relation to Economic Development and Social Change" (UNESCO, pp.53-96), which surely must compare with Park's early 1920 essays on the Western City in opening up vistas for research workers, is of great value; so, too, are the solid case studies of Kaye and Bopegamage, and the microscopic studies of social change carried out by Dore. Likewise the efforts of the socialist Asian countries of North Vietnam and China to control urbanisation (only briefly treated in the UNESCO publication) must be more thoroughly investigated. These studies need to be repeated many times to build up the scanty knowledge of the conditions of Asian urbanisation. A second requirement for such a policy is substantial governmental control over all sectors of the economy. Governments can "exercise considerable influence in the location of industries by the building programmes, by granting permits for the establishment of retail trade and various other inducements" (p. 43, UNESCO). They can also help prevent rural-urban migration by the establishment of rural programmes which increase agricultural production, and decentralise industry with emphasis on small village industries. Such measures would certainly be concrete efforts to modify the process of urbanisation.

If these two requirements could be satisfied, and the advantages outlined above utilised, there is no reason why Asia could not attack the process of urbanisation. But allowing for the present world conditions of the cold war, and the economic commitments and policies of the majority of the Asian nations, it is unlikely that a policy utilizing all these suggestions will come about.

T. G. McGEE

SOUTH AUSTRALIA: WATER CONSERVATION AND SUPPLY

One of the most important problems successfully tackled by South Australia has been the provision of water both for its population and for its rural and industrial development. The magnitude and reliability of the distribution systems constructed reflect keen foresight and intelligent planning by the State authorities and a battle won over natural conditions unfavourable for the impounding and storage of water.

The main task in water conservation and water supply consists of collecting and conserving the water available in the places where the supply is sufficient. Unfortunately South Australia has few such places. Only four per cent (15,000 square miles) of the State receives an average annual rainfall in excess of 20 inches, whereas 83 per cent receives a rainfall less than ten inches. The actual proportion of the rain contributing to stream flow is very low. For example, the average run-off from the watershed of the River Torrens is only 16 per cent (J. R. Dridan, 'Developing South Australia's Water Resources, with Special Reference to the River Murray,' *Journal of the Institution of Engineers,* 27, 3, March 1955). Average annual river flow of the Myponga River is only approximately 4,000 million imperial gallons, although the average rainfall reaches a maximum of 36 inches in the 45 square miles catchment (*Myponga Dam and Pipeline,* The Engineering and Water Supply Department, 1955, Adelaide). Several factors combine to cause this loss, but the two most important appear to be evaporation and percolation. Loss by evaporation in any part of South Australia is probably never less than 36 inches

and in many localities it may exceed 100 inches (The Engineering and Water Supply Department, 'Water Supply in Country Districts,' 1960. Revision of the article published, *Education Gazette*, July 1955, South Australia). Because of this high evaporation rate much of the winter rain is absorbed by the soil before there is any appreciable run-off.

Two areas of South Australia are regarded as self-sufficient in so far as water is concerned. First, the dry northern areas which obtain their water from artesian basins, shallow water bearing areas and artificial storages constructed as required. It is economically impracticable to convey water into these areas unless needed for important industries and settlements, as in the case of Woomera. Second, the southeast of the State where the rainfall is higher (over 20 inches) and is supplemented by sub-surface water flowing from Victoria. Although this area has surplus water available it is unlikely that any export will be attempted. Instead it is far more probable that industrial undertakings requiring large volumes of cheap water will be encouraged to develop in this region.

The primitive methods of water supply and distribution in early Adelaide were quickly abandoned after the establishment of responsible government. By the turn of the century both the Torrens and Onkaparinga Rivers, the two main rivers draining the western slopes of the Mount Lofty Ranges, had been exploited and three reservoirs, Thorndon Park, Hope Valley and Happy Valley, supplied water to Adelaide. These reservoirs were followed by Milbrook in 1920 and Mount Bold in 1938 and the combined capacity of the metropolitan supply reservoirs thus reached 14,000 million imperial gallons by the outbreak of the 1939-45 War. Following the termination of hostilities the consumption of water in Adelaide rapidly increased because of the rapid increase in population and because of the increase in the consumption per capita. Between 1947 and 1954 the population of the metropolitan area increased by 26.4 per cent and the consumption per capita by 21.7 per cent. While total water consumption was well under 8,000 million imperial gallons in 1938, it was over 19,000 million imperial gallons in 1957 (J. R. Dridan, 'The Harnessing and Use of South Australia's Water Resources' in *Introducing South Australia*, 1958, Adelaide, pp. 219-234).

As a measure to overtake the leeway which had developed through the cessation of civil construction during the War, the Mannum-Adelaide pipeline was constructed. Subsequent detailed examination of further available water resources around Adelaide revealed that two new streams offered advantages for immediate development. The new reservoirs on these streams, South Para — now completed, and Myponga — under construction, will initially increase the metropolitan firm annual water resource to approximately 28,000 million imperial gallons. However, as the reservoirs are also planned to provide for the expanding demand in their own areas, it is certain that the quantity of water available for Adelaide will seriously diminish with the increase in intermediate diversions. Thus the search for, and development of, new water sources must continue if Adelaide is to maintain its present rate of growth. Besides the enlargement of the retaining wall of Mount Bold Reservoir, future plans include the possible construction of additional reservoirs at Kangaroo Creek, Clarendon, Baker's Gully, Finniss Creek, Little Para River and Sixth Creek (The Engineering and Water Supply Department, 'The Metropolitan Water Supply, 1960. Revision of the article published, *Education Gazette*, March 1955, South Australia).

The only river of any magnitude in South Australia is the River Murray. For many years the river water has been used for irrigation and domestic pur-

poses by areas within and adjacent to the valley. In 1915 the River Murray Waters Agreement was ratified between the Commonwealth and the three interested States and this guaranteed South Australia a minimum monthly water flow in normal years and a fixed proportion of the water available in drought years. Under an amendment of the Agreement South Australia completed in 1940 the construction of five barrages across the channels connecting Lake Alexandrina with the sea and thus turned the lake, with Lake Albert, into a freshwater body and prevented sea water from entering the lower reaches of the River Murray. This created for the State an additional source of water. With the construction of a pipeline from Morgan to Whylla in 1944 the State entered upon a new phase in water development.

Two pipelines at present draw water from the River Murray, namely the Morgan-Whyalla pipeline and the Mannum-Adelaide pipeline. The construction of the pipeline from Morgan to Whyalla, a distance of 223 miles, was undertaken mainly to provide adequate water for the expansion of the Broken Hill Proprietary Company's activities and the parallel growth of Whyalla. Apart from its contribution to Whyalla the pipeline also supplies water to the Bundaller and Beetaloo water districts, to Woomera via a branch main, and to several mid-north centres. Although the capacity of the scheme is of the order of 2,000 million imperial gallons, the continuing development at Whyalla has made it obvious that in the future more water will be needed from the River Murray and plans have already been announced for the duplication of the pipeline. The Mannum-Adelaide pipeline was completed in 1954 and was designed to meet the rapid increase in the city's demand for water in the immediate post-war years. It not only delivers water to Adelaide through the River Horrens reservoir systems, but also supplies water to rural areas en route, and to other branch mains. The annual capacity is 14,600 million imperial gallons and this is being increased by the addition of further pumps. It is probable that by the time the population on the Adelaide Plains has reached 700,000 a further pipeline from the River Murray will be needed ('The Metropolitan Water Supply,' 1960).

Ninety per cent of the population of South Australia now depends wholly or partly upon Murray waters and there is little doubt that the State's future development will continue to be closely bound up with the river. Thus it is not surprising that South Australia should show more than a passing interest in the tremendous Snowy Mountains Scheme. Diversions from the Murray are not yet approaching the quantity available from this source but proposed schemes must carefully weigh the following: the Murray is not inexhaustible; high costs are involved in pumping water to heights of 1,500 feet to take it to areas west of the Mount Lofty Ranges; and the situation will eventually arise 'when each gallon of water pumped to remote areas for domestic, rural and industrial use will mean one gallon less for irrigation within the Murray Valley' (Dridan, 1958, p. 221).

Country towns and rural areas obtain their water supplies by a variety of means — from reservoirs supplying extensive distribution systems, from subsurface sources or from the River Murray.

The first large country scheme, the Beetaloo scheme, was completed in 1890 and supplied water to Port Pirie and to Kadina, Wallaroo and Moonta. This scheme was eventually connected with the Bundaller and Baroota distribution systems. Augmentation of the supply capacity by water from the River Murray has enabled the reservoirs to serve not only the farming areas of the mid-north, but also a large area in Yorke Peninsula which contains some of the best cereal producing land in the State. Total consumption has in-

creased rapidly during the last 20 years. In the period 1934-38 the amount of water supplied averaged 190,000 imperial gallons per square mile per annum, while in recent years it has reached 310,000 imperial gallons per square mile per annum ('Water Supply in Country Districts,' 1960).

The supply and distribution of water on Eyre Peninsula deserves special mention. Of its 32,000 square miles only 1,000 square miles has a rainfall of 20 inches or more. The first conservation scheme began with the construction between 1912 and 1914 of dams at Yeldulknie, Ullabidinie and Ulbana and was designed to provide water for the local farming country. This was followed in 1922 by the Tod River Scheme, one of the greatest achievements in Australian water conservation. In this scheme water is pumped from the Tod River Reservoir to a service reservoir on Knott's Hill and then gravitates 241 miles to Ceduna, distributing water to farms and townships on either side of the trunk main. Pipelines also connect with the Yeldulknie system and with Port Lincoln. Once again it was not long before the demand outstripped the supply. Particularly valuable as an augmenting source of supply is the Uley-Wanilla artesian basin. Although its area is only 20 square miles, approximately 500 million imperial gallons annually can be obtained and conveyed to the Tod River reticulation and to an extensive area on the eastern side of the peninsula previously in urgent need of water.

Many of the river towns are served with water from the Murray. Tailem Bend, Murray Bridge, Mannum, Morgan, Loxton and Renmark all draw water from the river, while Milang and Meningie are supplied from Lake Alexandrina and Lake Albert respectively. Usually the water is pumped to storage tanks and then gravitates through reticulation systems.

Capital invested on water supply works in South Australia amounts to approximately £(A.)60 million. The State proudly claims two achievements: the proportion of the population (95 per cent) receiving water by reticulation is one of the highest in the world; and no industry has been forced to turn away from South Australia through doubts as to whether sufficient water would be available for its processes. South Australia's ultimate development will probably depend upon the quantity of water that can be assured per annum and consequently it can be assumed that the State will not rest until every available water source has been thoroughly explored and exploited.

BRYAN SAUNDERS

NEW ZEALAND: PROBLEMS OF A 'COLONIAL' ECONOMY

'An economic historian engaged in putting the countries of the first half of the twentieth century into groups would take one look at New Zealand's exports and immediately place us in the economic category of 'colonial'.... (W. B. Sutch, 'Programme for Growth' p. 6, *Background Papers, Industrial Development Conference June* 1960, Government Printer, Wellington, 1960); an unorthodox view considering that New Zealand has one of the highest per capita income levels in the world, a fairly elaborate social security system, a highly urbanised population, with only 17 per cent of her labour force in the primary section. Nevertheless her 'exports are massive quantities of raw materials and comparatively unprocessed foodstuffs' (p.6) and she is dependent for her overseas earnings upon this small range of primary produce which is sold in a very few markets. In 1959 butter, cheese, meat and wool provided 85 per cent of the total £(N.Z.)305.9 million received from exports, whilst the United Kingdom accepted almost 60 per cent of these exports. Britain, with U.S.A., France and Australia accounts for nearly 85 per cent of the total exports. The

prices of these exports are subject to variations over relatively short periods and the terms of trade are rarely in New Zealand's favour, the result is a tendency towards marked instability in the economy, an instability incompatible with the widely accepted policy of full employment. Furthermore the rapidly increasing population must find an outlet in the non-agricultural sectors, but every increase in manufacturing capacity is liable to require more overseas assets to import the semi-finished materials for processing and assembly, so that when 'foreign exchange is short it becomes necessary to cut sharply the supply of imported materials for too many industries' (p. 14). Indulging in some economic hyperbole W. B. Sutch places New Zealand, in its international trading context, with Ghana, Malaya, Cuba, Bolivia and Venezuela. Whereas New Zealand despite years of self government has continued in its colonial economic status, he cites Malaya's refusal to rely on 'international specialization in a world where economic doctrines once taught in England cannot apply' (p. 17) and her recent attempt to build an industrial counterweight to her vulnerable rubber and tin economy. He dismisses the prospect of a free trading world, rejects the philosophy behind GATT, whilst underlining the growth of State directed economies in the world and touching upon the fear in New Zealand of regional economic groupings. If, he argues, New Zealand remains content to rely on its farming industries '... it faces falling living standards and a falling population ... and ... will remain a country with many colonial features while other former colonies ... are rapidly bringing a balance to their social and economic life' (p. 18).

In his opening address to the Conference the Rt. Hon. Walter Nash briefly commented on his own work in bringing an element of stability into the economy, but went on to recognise that for the 1960s '... it is time to shift the emphasis from security and stability ... and to direct our own efforts towards economic growth' ('Building the Future,' p. 7). With this in mind he announced the Government's aim 'to encourage the development of industries which can process New Zealand or imported raw materials in their crudest form through to their most finished stage' (p. 14). At the same time new resources are to be explored and new skills developed. To remove any doubt that growth might be a painless affair, Sir Douglas Copland, whilst stressing that a policy of *laissez faire* is no longer requisite to New Zealand's position and advocating a long term plan, suggested that the ratio of investment to gross national production should approach 30 per cent ('Economic Problems for New Zealand in an Expanding World,' p. 7). With these preliminary statements in mind and with the benefit of the information contained in the 41 Background Papers, plus a useful number of statistical appendices, the delegates to the Industrial Development Conference broke up into three committees to produce on the fifth day their Report (*Report Industrial Development Conference, June* 1960, Government Printer, Wellington, 1960). The Background Papers have inevitably a wider appeal than the Report and they provide a topical and detailed picture of New Zealand economy. The papers fall into four groups: those dealing with the primary industries and the development of natural resources (inevitably a short section); those dealing with questions of transport and distribution; a third section devoted to overseas trade and associated problems; and a fourth and longest section covering a whole range of industrial topics.

R. M. Hutton-Potts takes up the question of the regional distribution of industry (Background Paper 21) and argues for 'a pattern of industry spread throughout the country.' The basis of his argument is apparently the growing concentration of the population in the North Island. (At the turn of the century the North Island possessed half of the total population, by 1921, 61 per

cent and by 1956, 67 per cent.) But his argument is weakened by the fact that no obvious detrimental effects have appeared from this swing of population to the north (the functioning of the Welfare State itself is, in part, responsible for this), and it is very difficult to foresee how industry can be spread when the population is continuing to cluster around the four main centres. Hutton-Potts appears to fall into the common error of confusing geographical spread and economic-demographic spread. Any case for the decentralization of industry needs to take account of the future employment problems of the strongly Maori areas, but this points to the need for more industry and decentralization in the North not the South Island.

Appreciating this problem Noel J. Wood writes 'We cannot afford to allow Maori population to pile up in backward rural areas which are incapable of carrying any great concentration of people.' Without referring to the very great difficulties involved in the industrialization of the Maori, he continues, 'We could be committing a supreme folly if we pursued overseas immigation to the point of creating a racial problem of underemployed Maoris . . . while the immigrant labour filled the vacancies for labour in other areas' ('Immigration and the Labour Force,' Background Paper 26). Committee III reporting on Human Resources recognised these claims on behalf of the Maoris but urged an annual intake of 15,000 or 20,000 immigrants over the years 1960-4, the emphasis to be upon skill, and technologists, technicians and teachers. Significantly, for a country preferring the 'Nordic races,' the Committee recommended the 'choice of immigrants should not be restricted to certain nationalities if others can provide the skills (although the preference for British and particular persons is expressed)' [*sic*] (Report, p. 133).

The New Zealand factory is characteristically a small factory, 30 per cent of the labour force is employed in factories employing 20 people or less; an equivalent proportion works in factories of 100 or more persons. In the period 1956-8 the proportion engaged in the smallest factories, 20 or less persons, declined slightly, whereas the 100 plus group increased from 30.2 per cent to 35.8 per cent; notably the increase has occurred in the 200 and over group (W. Fisher, 'Ownership and Control of Industry in New Zealand Manufacturing,' Background Paper 34). Comparing the value of output per person by size of plant, '. . . . there appears to be a danger zone for many factories. They can be efficient with up to 50 workers. Beyond that number there is a loss of efficiency which is not overcome until they move on to the over 200 class.' The implications of this to the future of manufacturing are worthy of consideration because 'There appears to be a case for rationalization in some industries where mergers would make possible economies of scale and the use of capital equipment to manufacture in depth,' otherwise, 'The danger is that if there is not rationalization in some fields overseas firms may move in and absorb existing companies.'

A cautious attitude to overseas control and investment was expressed in other papers such as W. Rosenberg's ('Financial and Monetary Policy and Capital Requirements for Industrial Development in New Zealand,' Background Paper 37), and also by Rt. Hon. W. Nash: 'We are not anxious to have industries in New Zealand which are fully owned and therefore controlled overseas . . .' It might surprise Gunnar Myrdal (*An International Economy*, London, 1956), to find such an antipodean application of his viewpoint and in a country not usually considered as underdeveloped. However no one could complain of the freewheeling ideology that abounded at the Conference. On the one hand the absence of the competitive spirit in industry and business was deplored; 'it would be difficult to find another country with as rigid and pervasive limitations on competition as those that have existed in New Zea-

land. Restrictive trade arrangements go with stagnation, they limit the introduction of new techniques, they create inefficiency, they raise costs, and they are antagonistic to development' (W. B. Sutch, p. 21). On the other hand the functioning of price mechanism itself seemed to be questioned. 'The Conference considered that some measuring stick is needed to assist in the aim of encouraging the allocation of resources into the most efficient uses' ('Summary of Reports,' 6. 83, *Report*). One can only surmise that the full implications of this statement were overlooked by the eighty delegate bankers, wholesalers, retailers and manufacturers who attended what was in many ways an unorthodox Conference.

S. H. FRANKLIN

Geographical Reviews

THE ALIEN EYE

Richard K. Beardsley, John W. Hall, Robert E. Ward, *Village Japan*, The University of Chicago Press, Chicago, 1959, pp. xiv, 498, Illus., Maps, Glossary, Index, $8.75.

Village Japan is a detailed study of the buraku of Niike, a rural hamlet of 24 houses, located on the Okayama Plain on the main island of Honshu. Field work was undertaken by a diverse group of specialists, under the auspices of the University of Michigan's Centre for Japanese Studies.

For this geographer at least, this is the most important book about post-war Japan. The volume attempts to cover every activity and organisation in Niike. Thus its scope is tremendously wide and in its 498 pages it deals with the history, geography, economy, sociology and political life of the hamlet and relates these to a wider environment. There is an excellent chapter describing the material goods and equipment of the village which, even for those with first-hand knowledge of Japan, contains much new information. The chapter 'Land and Water' emphasises the close relationship of water supply and rice agriculture. Water control is of such paramount importance that to handle the long-established intricate irrigation system the buraku is joined co-operatively into a large common law organization transcending even prefectural boundaries. In the chapter 'Niike at Work' land use and agricultural techniques are very well illustrated and a short section describes non-agricultural occupations. Although certain aspects of the community are illuminated with brilliant clarity, as is almost inevitable in a book of this size, parts will appeal only to the specialist. In the last three chapters an attempt is made to show the place of Niike in the larger community, but the connection becomes tenuous and one is overwhelmed by the complexities of local government, political processes and religion.

The book gives a picture of a Japanese rural community before the full impact of modern life has impinged upon it. The household is the prime unit but the collective households are also a communal entity and the community is more important than the family except in times of extreme stress. Male primogeniture is customary and marriages are arranged. Thus the traditional is more important than the modern in social relationships, but the beginnings of change are suggested by the description of the high school graduate who wished to become a typist. Despite her mild attempt at self assertion this girl expected that she would accept her parents' choice and marry a farmer. In future with increasing pressure from the cities, individual choice will probably take precedence over traditional practice.

Repatriation of nationals from overseas after the War, the occupation of the country, land reform, land consolidation and a multiplicity of technological improvements have had an impact on the community which the survey fully describes. One question remains unanswered. What effect did the large team of investigators have on Niike even before the end of the study? A comprehensive research project such as this cannot be made at an instant of time. Whilst the study was in progress (it continued over seven years) changes took place, changes undoubtedly accelerated by contact with the Americans. Evidence for this is in the autobiographies of the two women, in which one of the most important events in their lives was the contact with the study group. Consequently the 'typical' nature of the village may have been slightly invalidated. Did John Embree get a more valid view of Suye Mura? Would local specialists have certain advantage in this respect?

Technically the publication is of excellent quality, the photographs grouped into one section are good and the mapping is outstanding. Particularly pleasing and informative are the high perspective line drawings. But the use of the book for reference is hampered by the omisssion of footnotes and a bibliography. A real deficiency is failure to refer in detail to the field notes which we are informed are held at Ann Arbour, Michigan.

This fundamental book is important not only for its description of Japanese rural life but also because it indicates that a real contribution to the understanding of one cultural group can be made by the people of an alien culture. Perhaps the objective, perceptive eye of the outsider is required to see a community in its true perspective. Despite the large numbers of competent Japanese specialists working in this field none has been so successful as these writers in depicting his country to the West. It is obviously still valuable for Westerners to do field work in Japan and we would doubtless gain if Japanese scholars made a similar study of a Western community.

J. W. MACNAB.

MULGA AND MESQUITE

H. C. Allen, *Bush and Backwoods: A Comparison of the Frontier in Australia and the United States,* Michigan State University Press, East Lansing, 1959 pp. 153. $3.50.

Many historians, and not least those of Australia, are sceptical of the value or validity of the frontier hypothesis. They have equated its findings with environmental determinism, and because in the main they prefer social determinism, if determinism there must be, tend to discount arguments in its support. The frontier of settlement in Australia was never the visibly apparent social crucible that it was in America. There, Census officials were able to plot, decade after decade, the steady westward progression of the line of population density above two persons per square mile and thus give Turner statistical backing for his ideas. Even today the line of comparable density in Australia stands nowhere more than 200 miles from the coast, and to this distance only in parts of the east and south. If this is the mark of the frontier, then either Australia has scarcely had one, or most of the country is still beyond it.

Allen's enlightening discussion, therefore, starts with the initial handicap that there is just nothing in Australia comparable with the American frontier, for irrespective of its other qualities a frontier must by definition have location, must be a line of demarcation and separation. In this sense, the only Australian frontier was that of the great pastoral expansion, for in this exceedingly rapid progression of settlement across the continental space the occupied was always

separated from the unoccupied in fact if not in law. But to say, as Turner maintained of America, that Australian society underwent "perennial rebirth" with the forward movement of the pastoral frontier is contrary to fact. The miners came later, and their activities could hardly be termed frontier activities. Allen himself implicitly recognises this type of difficulty when he says of the irrigation farmers that theirs was "not properly a frontier phenomenon," (p. 81) because the frontier had long since passed when irrigation began. If the term frontier is to be applied to more than spasmodic phases of Australian history there must clearly be a redefinition of the word itself.

All this makes one wonder whether the Turner discussion should not simply be labelled the New Settlement hypothesis, and forget about the word "frontier." Australian historians have long been conscious of the fact that in the process of settling the land there were a number of subtle changes wrought in the pattern of folkways, and perhaps even in philosophical attitudes. But the argument that rural settlement was a primary force in stimulating democracy neglects the powerful Irish and convict "agin the government" attitude of the majority of the early settlers, and the influence of imported Chartist ideas. These things were grafted into Australia with its people not grafted on to the people by Australia. Because Allen recognises this flowering of democracy as one of the prime similarities and because, contrariwise, many European historians correlate the rise of democracy with urbanisation, one is left in a quandary as to the precise comparisons that can be drawn between the results of the settlement process in the two countries.

But the book does succeed in providing a useful summary (an essay, in the author's words) of published Australian literature on the effects of settlement in a strange land on a European people. Because a good deal of this material is argument rather than proof it gives an inevitable bias to the conclusions of the essay. This is not to say that it does not provide useful insights, although most of these naturally come from the sources quoted. However, the comparison between Australian pastoral expansion and the westward movement of the cotton belt in the American South, both extending their domains through the power of a mainspring located on the coalfields of northern England, is a useful one. The introductory chapter on the differing geographical circumstances of the two areas is valuable, even if the included facts are more than familiar to geographers and historians alike. The similarity in the treatment of native peoples in the two areas is remarkable, and duly noted. And the warning that cities are important in moulding national character is certainly well taken.

Here one must point out a curious deficiency in Australian historiography that finds its reflection in the book. In his concluding section Allen notes that "the self-reliant, optimistic, ingenious, individualistic, independent American of the pioneer *farmer's* frontier was markedly different from the socialistic, sceptical, rough-and-ready, "mate-conscious" collectivist Australian of the rural *wage-earner's* frontier" (Reviewer's italics). But surely if a comparison of frontier influences is to be valid it should be made between similar categories of people in the two countries. So little has been written about farmer settlement in Australia that this might be excusable in Allen's case, limited as he was in terms of time to make his study. But that such a hasty comparison was indeed made suggests that the matter has not been closed by this book. Of the Australian farmers it is probably true to say that on all counts except that of optimism they paralleled their American counterparts within the framework of their society; and even in the case of optimism, were not the Australians always pushing into "better country further out?"

This book is a valuable contribution to comparative historical study. Its shortcomings stem from basic deficiencies in its source material, and not from the methods used. It is extremely interesting, and the ideas put forward are stimulating even though they require further investigation.

A. J. ROSE

ADDITIONAL RESOURCES

Five new maps for the *Atlas of Australian Resources* are now available from the Department of National Development at Canberra. The maps, each accompanied by a commentary, are entitled *Croplands, Geology, Immigration, Mineral Industry* and *Manufacturing Industries.*

Four separate maps comprise the map-sheet *Croplands,* viz., Wheat Acreage, Wheat Yield, Other Major Crops and Minor Crops. The two most interesting are of Wheat Acreage and Wheat Yield for they emphasize two important post-war developments in Australian wheat growing; first, the general decline in total acreage under wheat, and second, the increase in yields per acre. The other maps cover all the important farm crops, including field crops, market garden crops and those of orchard and vineyard.

In handling the presentation of the data the compilers have shown initiative in combining various cartographic techniques. However, it is to be regretted that in three instances colour employment shows a disregard of appropriate procedure. First, the graded representations for the percentage decrease or increase in the acreage under wheat and for the average yield per acre are technically incorrect and this detracts from the visual impression. Second, it is difficult to determine the distribution of sorghum. A far better effect and a greater degree of legibility would be obtained if the dot colours of sorghum and sugar cane were interchanged. Third, the yellow symbols for plantation fruit, flax and canary seed are not successful. With one possible exception, the necessary background and environment contrast is not present and consequently it is difficult to identify the symbols.

The surface geology of Australia is shown on a scale of 1:6,000,000. The map-sheet *Geology* is essentially a brief geological history of the 'fossil continent' from about 3,000 million years ago to the present. Easily identified are the three physiographic regions of Australia. In the main the Great Western Plateau, covering about 2 million square miles, is based on a Pre-Cambrian shield; the Central-Eastern Lowlands, generally below 500 feet, on level-bedded deposits of late geological age; and the Eastern Highlands, a great belt of elevated land with a complex geological history, on Palaeozoic formations. Correlation with the map-sheet *Mineral Industry* emphasises that, as in other parts of the world, some of the richest mineral provinces are associated with the Pre-Cambrian shield.

The compilers must be congratulated on the success of their colour selection. In the choice of single colours they have achieved forms which represent clear-cut expressions of the colours used, while in the choice of colour differences they have achieved colours which aid considerably appropriate identification. However, one criticism and one suggestion seem in order. The criticism—all the categories on the map-sheet are differentiated by purely hue contrast and no attempt is made to utilize value differences. It is safe to assume that colour, with all its alleged attention advantages, reaches saturation point when displayed with many variables of the same type. To avoid this, interest should be created through variety, or in other words, through change in colour form. The suggestion—superimposed symbols can effectively reduce (and this

is often desirable) the number of colours employed on a map. For example, the Tertiary deposits could be profitably represented by one colour if superimposed symbols were used to differentiate between the basalt volcanics and the alkaline volcanics. This procedure would provide a connection (colour) and a distinction (symbol) between the deposits.

Four maps depict the distribution of 1947-54 immigrants and the immigrant contribution to population growth between 1947 and 1954 (map-sheet *Immigration*). Although immigration has been an important factor in population growth throughout Australia's history, it is the latest influx of migrants (1,007,000 net intake between 1947 and 1958) that is particularly impressive for it is contributing substantially to a remarkable upsurge in the present rate of population growth. The impact of this influx on the population age structure is admirably described by J. Zubrzycki in the accompanying commentary. Post-war immigration to Australia has conformed to the characteristic trend towards increasing urbanization. For both Sydney and Melbourne the contribution of immigrants to urban growth betwen the censal years was in excess of 60 per cent of the absolute growth.

The reviewer would like to have seen represented, first, a percentage breakdown for the State capitals of immigration according to birthplace, and second, a regional analysis of ethnic settlement. Much interesting information would thus be presented. Generally immigrants from Eastern Europe show the highest degree of urban concentration, while those from Scandinavia, Italy and the Netherlands show a significant rural dispersion. Italians are the most important immigrant group in north Queensland (in 1954 they constituted exactly one half of the total of oversea-born persons). Both the British component in the Latrobe Valley and the Netherlands component in the Wollongong-Port Kembla area underwent striking increases between 1947 and 1954. The colour work in the urban maps is both pleasing and effective. However, in the rural maps two procedures call for comment. First, the colour change drafted to differentiate between rural areas with a population of less than one person per square mile and rural areas with more than one person per square mile is not successful. An isoline would have been far more functional. Second, the graded colour schemes used in these maps were unsatisfactory. In this type of representation more emphasis should be placed on intensity changes of one hue rather than changes in hue.

The map-sheet *Mineral Industry* draws attention to the important part mineral production plays in the Australian economy. Black coal is obtained in all Australian States, although New South Wales has the lion's share, accounting for 75 per cent of the total production. It is clear that further expansion of the manufacturing industries must depend upon the development of mineral resources and it can thus confidently be expected that the near future will see an increasing realisation and appreciation of the continent's mineral potential. At the present time Australia is in the happy position of producing most of her own mineral requirements as well as being an important exporter of a number of minerals.

The map, drawn to a scale of 1:6,000,000, exhibits a high standard of draughtsmanship. Proportional symbols represent the value of mineral production and also indicate the treatment stage (unfortunately some of the lettering associated with the smaller symbols is difficult to read); flow lines indicate the mineral movements to principal treatment and consumption points; and colours show the main metalliferous areas and ore provinces.

The importance of manufacturing industry in the Australian economy is clearly indicated in the nine small maps of the map-sheet *Manufacturing Industries*. The centre map depicts Employment in the various manufacturing in-

dustries, while the other maps show the distribution and size of eight groups of selected industries. Four features deserve to be mentioned. First, most manufacturing industries are concentrated in the State capital cities, although important exceptions located in provincial centres or on coalfields do exist. Second, New South Wales, with 41.5 per cent, and Victoria, with 33.5 per cent, are the dominant manufacturing States and employ nearly 790,000 or 75 per cent of Australia's total factory working population (1,057,000). Third, the present gross value of Australian factory output exceeds £(A)4,000 million and is about a third greater than the value of production of all primary industries. Fourth, only 18 per cent by value of imports are now in the form of finished consumer goods.

The map-sheet is another example of good draughtsmanship. In the first place a tremendous amount of activity has been successfully presented in a limited part of Australia, and in the second place the arrangement and selection of colours is probably the finest devised by the Department of National Development. One change in technique would have been appreciated, namely the replacement of the divided circles by bar diagrams. With the present system of representation comparison between the main centres (such as Adelaide and Newcastle) of employment in the various manufacturing groupings is not easy and unfortunately the accompanying commentary does not present a detailed analysis of this information.

BRYAN SAUNDERS

BEACHCOMBING IN WHITEHALL

W. P. Morrell, *Britain in the Pacific Islands,* Oxford University Press, London, 1960, pp. ix, 454, 55s.

In this book Professor Morrell has written of British influence and activity, official and otherwise, in the broader context of European penetration of the Pacific islands. In doing so, he has largely excluded Hawaii and New Zealand, from whose history he might have taken themes closely relevant to those of some of the territories on which he has concentrated; and, perhaps contrary to what his title might suggest, he has dealt principally with events of the nineteenth century, devoting only a brief chapter, by way of an 'epilogue,' to 'The British Pacific Islands in the Twentieth Century.' As a further limitation, the author has relied mostly on printed sources, a notable exception being his use of the Pacific Island Series Foreign Office 58. To have covered all of the original records, he states in his preface, would have been too great a task; and besides, had he attempted it, he would have been overwhelmed with data and would have defeated his purpose. Instead, he has endeavoured to consult the manuscripts 'at points where it was impossible otherwise to understand what was happening.'

Professor Morrell is surely right about the difficulty of combing through the vast and dispersed Pacific literature. At the same time, the existing bibliographies are not comprehensive enough to enable the author of a general work such as this to select, with facility, the bulk of the available material bearing on his subject. The same problem will, of course, affect the judgment of readers, and so it must be specified that the following comments are to apply in particular to sections of this book dealing with Polynesia, the present reviewer's special area of study. With this understood, it may be noted that, while Professor Morrell's declared interest centres 'not in Downing Street but in the islands,' he seems to have passed up or used only sparingly many of the sources most cogent to his purpose, and to have embraced many others

which focus more on external interests than on actual conditions in the islands. Such is the disadvantage of depending on selected sources for clues to govern the sampling of the rest that this book not only lacks reference to many known developments of importance and skimps detail in respect of others, but sometimes takes little account of conflicting evidence on matters controversial or complex.

Printed missionary sources, which the author describes as a 'formidable mass of first-hand evidence,' are often less reliable as historical records, because of their elements of propaganda, eulogy and self-justification, than are the manuscripts, especially the diaries and journals. Indeed, without recourse to the latter it is scarcely possible to document some of the most significant aspects of mission activity, including the missionaries' interference in local politics, their differences regarding the form and conduct of government in the Pacific, and their handling of questions of imperial intervention. On all of these counts Professor Morrell's chapter 'The Polynesian Missionary Kingdoms' is deficient.

A statement in the same chapter (p. 47), to the effect that the first resident missionaries in Rarotonga 'managed to unite the three tribes under a single code of laws,' suggests a centralized political order which was not in fact achieved and, in turn, recalls a major problem confronting Pacific historians—how to acquire sufficient understanding of the indigenous societies and the aspirations of their members to facilitate analysis of 'culture contact' situations. The author has emphasized, in this regard, the value of consulting anthropological treatises and of visiting the islands, even though certain conditions there may have changed radically over the years. But not less useful, particularly in respect of Polynesia, is the testimony of the islanders themselves, which is often found in the native languages and, for the most part, in manuscript form only. This large body of material, which Professor Morrell does not mention, dates well back into the nineteenth century and throws light on many subjects, such as chiefly authority, land alienation, and the formation and identity of native political factions, that European observers, perhaps from self-interest as much as ignorance, tended to misinterpret or over-simplify. It is partly from neglect of what the islanders had to say that histories of Samoa, for example, have been so vague about the forces operating from within that group—so prone to name sects and political alliances without explaining their origins, composition and aims, or to stress the clash of foreign interests without revealing the local conditions that contributed to it.

Also of value to the island-oriented historian are the consular post records, which include much material, notably in reference to commerce and political development, that is to be found nowhere else. Of a rather similar nature are those archives of island governments to which scholars may gain access. To take a final example, what of the newspapers published in the Pacific area? These—*printed sources*—are seldom cited by Professor Morrell, yet they are among the richest mines of local news and information.

In the opinion of this reviewer, then, this book, whatever the compelling reasons, leaves too much data unexplored to be considered adequate as a study 'centred . . . in the islands.' That the author has so described it is unfortunate, for it is still probably the best survey of European elements in the recent history of the Pacific. More order might have been imposed on the material, e.g., by drawing sharper comparisons and contrasts between developments in different islands, but better the present form than synthesis round a theme such as 'minimum intervention' or overuse of the concept of 'international rivalry', which Professor Morrell has taken pains to avoid.

R. P. GILSON

LOST — THE PACIFIC

B. W. Sparks, *Geomorphology,* Longmans, London, 1960, pp. 371, Illus., Index 50/-

In the literature of geomorphology there are some famous examples of the pure art of exposition, by men who added to a clarity of word an equal clarity of diagram and sketch — Davis himself, Cotton, Wooldridge, Strahler. Mr Sparks continues the orthodox approach to the study of landforms in the sequence which experience has shown to be sound, working from weathering through slopes to rivers and river systems and so on. His explanations are clearly worded, he avoids jargon where possible, but his diagrams, though adequate, are not in the same class as the sequential series which makes, for example Strahler's *Physical Geography* so valuable for first year university geography students.

This book is obviously aimed at British students, for the author gives a detailed chapter on the influence of rocks on relief which is clearly intended to make their own landscapes intelligible to them. In accord with modern views he has a special chapter on the development of slopes, where he enumerates some sound sense, in particular on the difficulty of applying statistical method where so many factors, particularly historical ones, are quite unknown. A chapter on the importance of changes of climate bears on this problem but its length of only five pages may reflect rather the lack of soundly based information than small interest on the author's part, for this difficult field is more and more coming to be seen as the key to the interpretation of the present landscape.

But a New Zealander puts down the book with a vague feeling that something is wrong, and then realises with a start what it is. Nowhere is there any discussion of a landscape in active tectonic movement, that landscape which is so much a part of the rim of the Pacific. The bearing of tectonic movement on landforms, the knowledge it has given us of the timing of erosive processes, the whole pattern of transcurrent faulting as it affects landform, simply do not exist for the author, in spite of the abundant geomorphological literature which deals with them. This, in view of the detail in some other chapters, simply leaves the reviewer completely at a loss.

D. W. McKENZIE

THE WOOD AND THE TREES

Julian H. Steward and Louis C. Faron, *Native Peoples of South America,* McGraw-Hill, New York, 1959, pp. 481, Maps, Illustrations, Index. $8.50.

Oscar Lewis, *Five Families,* Basic Books, New York, 1959, 350, pp. $5.50.

Though it is most appropriate for readers of *Pacific Viewpoint* occasionally to glance across the Pacific and study the problems and peoples of South America, such readers might well ask themselves whether there is at present any scope for another volume about South America so soon after the publication of Steward's monumental *Handbook of South American Indians,* six volumes, 1946-50. The answer obviously is in the affirmative. For one thing the *Handbook* is hard to come by; secondly, its very encyclopaedic character often makes it difficult to use especially by those non-experts who are quite reasonably more anxious for a synoptic over-view than the ardours of hacking their way through huge mountains of facts. Thus, Steward and Faron will probably never supercede the *Handbook,* but at least their briefer 500-page synopsis serves to fill a gap paradoxically left open by the huge publication. Among other virtues of the

smaller volume is the masterly balance the authors have kept between a multitude of facts on the one hand and a few interpretative principles on the other. We are thus now able to see the wood apart from the trees, and trees themselves take on new significance as they are ordered by a few landscape contours. Steward and Faron are not exactly readable in the popular sense. But their book is written in a plain, sensible literate style, nicely supported by a number of valuable synoptic tables and a minimum number of adequate illustrations.

The *Native Peoples* starts with introductory chapters on the role of environment, production, culture, demography, in the life of the South American Indians. It continues with material on the tribal and linguistic distributions of the 178 local sociocultural groups of South America. This preliminary clearing of the field is then followed by analyses of the more important regional civilisations: Andean, Trans-Caribbean, Tropical forest Chiefdoms, Nomadic Hunters and Gatherers. A final Chapter briefly summarises the origin and development of South American cultures. It concludes with a brief statement about post-European changes and the effects on the aboriginal cultures of present and future industrial influences. The total result is almost that of a small handbook in its coverage, but a handbook that is easily read and comprehensible.

Partly the ease of comprehension derives from the guiding principles of interpretation that Steward and Faron have used to organise their facts. In these principles it is possible to recognise the skilled and highly learned mind of Steward in particular roving easily over the field that he has made so much his own. Rather crudely summarised these principles are as follows: First, the several types of South American cultures are the results of the ways in which these societies have organised themselves in relation to subsistence or food-getting activities and the use that has been made of surplus production for the support of special groups, such as artisans, priests, military and political leaders. Second, Steward and Faron have asked themselves the meaning of the archaeological record, not merely with regard to sequence of types and styles of ceramics, architecture and the like, but more generally with reference to the utmost sociological meaning that can be extracted from the data: why, for example, the desolate coast and high cold interior of Peru and Bolivia developed one of the world's great ancient civilisations and why the northern Andes of Ecuador and the southern Andes of Chile, both borrowing elements from the Central Andes, developed civilisations that differed not only from each other but from the central Andean culture as well. The third principle of interpretation is to organise, where possible, the data round the interaction of the European conquerors and colonists with the Indians in South America. Such principles, simple as they may seem in mere summary, are made to serve as a more than adequate framework for holding together what might otherwise be a mere conglomeration of unrelated facts.

Many readers of this Journal will turn with almost indecent haste after opening the book to read Steward and Faron's summary of transoceanic influences on South American cultures. They will find (pp. 34-41) an outstandingly judicious summary of the biogenetics of cotton, the bottle gourd, the sweet potato, the yam and maize, which concludes in part with the statement, "we must conclude that, impossible as it seems, man somehow crossed the Pacific before 2000 B.C. bringing domesticated cotton and gourds and possibly maize from Asia. Much later he brought yams and on return voyages took the new hybrid cotton, sweet potatoes, hibiscus and perhaps several weeds to Polynesia" (p. 41). Of cultural artifacts like the blowgun, panpipes and bark cloth which have been noted as occurring in both Oceania, Asia and South America, the authors offer the conclusion that "it is impossible

at present to provide a definitive answer to the question of how much influence Asia exerted on South American cultures. Isolated similarities might be explained away as parallel developments, but it seems unlikely that the rather imposing list of botanical and cultural similarities does not show some kind of transoceanic influence" (p. 42). We are now apparently left with the conclusions that *"impossible as it seems"* contact took place before 2000 B.C. and on the other hand, *it is impossible* to answer the question of how much influence took place. A rather negative and non-committal kind of conclusion perhaps, but for those who have tried to remain relatively immune to *Kon-Tiki* enthusiasms, probably the only kind of answer that the data at present permit.

In a necessarily brief review it is impossible to do more than indicate the major achievements of the *Native Peoples.* Its virtues are clarity and good judgement, neither of which however could have been gained except on the basis of extensive knowledge and intensive reflection. The book is not only an outstanding supplement to the *Handbook,* but stands in its own right as the best shorter survey to date of the Indian problems and peoples of South America.

Oscar Lewis, author of the already well-known *Life in a Mexican Village, Tepoztlan Revisited* (1951), and latterly of an interesting study of *Village Life in Northern India* (1958) returns to his Tepoztecans in this book in Mexico. In concentrating on the life of the village Mexican, many of them now living and working in Mexico City, Lewis in his own way is writing the present chapter (though probably not the last) of the saga that, beginning with Redfield, has made Tepotzlan one of the best known village communities in the world. Here the story is brought up-to-date with an account of the adjustment of some Latin American Indians to the demands of contemporary industrial life. Lewis makes the point that poverty has its own culture (an echo of Karl Marx, perhaps?). To define the morphology of this culture he hopes that his Mexican study will be followed by comparative studies of poverty elsewhere in the world. This proposition reminds one of the obverse proposition sometimes made by students of national character to the effect that the middle and upper class inhabitants of Paris, London and New York are more alike in their culture because of their wealth and city life than they are different because of their different social heritages. Whatever the truth in these propositions, we do not have to be concerned with their truth in order to appreciate Lewis' contribution to Mexican studies.

Lewis has developed an interesting technique of "depth analysis" to delineate the effects of poverty on his Mexicans. He simply lays before us five ordinary days in the life of five ordinary representative families: the families are of course fictionalised, but the accounts are based on the facts of everyday living with them. One of the families still lives in a Mexican village, three of them now live in different parts of that great urban sprawl that is Mexico City, the fifth family is that of a post-revolutionary millionaire living in a wealthy suburb. Each story is prefaced by a cast of characters. If one takes time to study this cast, then one has the kind of orientation that makes it possible to follow easily the record of daily incidents. The stories are all vivid, exciting, informative. Taken as a whole they probably provide a better guide to many aspects of contemporary Mexican life than most so-called guides or ethnologies

The reason for this is not hard to find. Most traditionally composed ethnologies, following supposed canons of scientific objectivity, are organised round the description of social systems or structures, in which people are largely irrelevant. Perhaps this is correct if one is writing sociology. But the for-

gotten men of the conventional account go on living, whether the books tell about them or neglect them. It is Lewis' great success that he forces us imaginatively to participate in the lives of these Mexican families. By doing so, we see Mexico with literally our own eyes. We gain an increased appreciation of impact of urbanisation upon a traditional "folk" people. For what is happening today in Mexico must also be happening in Africa, in Asia and in the port towns of Oceania. Mexico may be far removed from the Western Pacific in space, but what is happening there has much to tell us about our own area.

In an appreciative introduction to this book, Oliver La Farge, well-known novelist and friend of the North American Indian, comments on the fact that his dominant impression about these urban Mexicans is the deep-seated malaise of their lives, "the rarity among them of happiness and contentment, the rarity of affection" (p. ix). Other readers will probably have the same impression. The general malaise applies even to the life of the millionaire family, and so must be associated not so much with economic poverty as with the impoverished culture that these families have been able to find or build for themselves in the large city milieu. Their culture turns out to be spurious rather than genuine, as Sapir tried to phrase the matter many years ago. This impression of malaise is of additional interest to the reader because to a certain degree it helps to correct the impression that Lewis gave of these same Tepoztecans in his article, "On Urbanisation without Breakdown" (*Scientific Monthly*,) 75, 1952 pp 31-41. At the time one thought that the implications of that article were almost too good to be true. Now it is possible to see that one's first impressions of the urban Mexican need correcting by the full family histories contained in the present book. These Mexicans may not be living in a disintegrating culture, but they are part and parcel of one that is far from being rich and coherent. Malaise may therefore be the initial common denominator of urbanisation whether it occurs in Mexico or the Pacific.

If Steward and Faron have given us the overall picture of the solar macrocosm that is South America and its native peoples, Lewis helps us appreciate the microcosm of present day Latin American life. The one book is thus an admirable complement to the other. Between the two of them we can learn of the experience of one whole continent as its native peoples run the whole gamut of history from aboriginal civilisation to contemporary urban industrialisation. And what we learn from this one continent has its analogies and parallels in the Pacific. The comparative understanding of this history as a prelude to the study of contemporary social life could very well start from the analysis of these two books on Latin America.

ERNEST BEAGLEHOLE

Pacific Viewpoint

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The Ceylon Ten-Year Plan, 1959-68

B. H. FARMER

CEYLON bears many of the marks of an underdeveloped country, though not so deeply nor so grievously as her great neighbour, India. Ceylon's annual income per capita in 1957 was said to be of the order of £38, about one-eighteenth that in the United States but nearly twice that in the Republic of India. Income per capita, although it may have risen until 1951 (apart from a break during the depression of the 1930s), during the last ten years has failed to rise at all markedly, and may even be declining. Nutritional standards are low: the intake of calories and protein per capita is not much more than half that in the United Kingdom. Some 53 per cent of the working population is engaged in agriculture, fisheries and forestry; but this proportion is, of course, much lower than the corresponding proportion in India. Moreover, the figure just quoted includes workers in tea, rubber and similar factories, who ought perhaps to be considered as industrial workers. As it is, 11 per cent of the work-force is recorded as engaged in industry, and a further 20 per cent in commerce.

Ceylon also resembles other underdeveloped countries in the relatively low technical levels of the indigenous peasant agriculture. But these levels are much higher than those in, say, Africa, for the basic agricultural technique is rice cultivation, which not only demands great skill but permits much higher yields per acre and per capita than African shifting cultivation. True, it used to be said that the yield of paddy-fields in Ceylon was only 14 bushels per acre, which put the country well towards the bottom of the list of rice producers. But sample surveys have shown that the true average yield in 1951 was 31 bushels per acre. This, besides being a forceful commentary on the unreliability of the earlier statistics, puts Ceylon on a par, roughly, with Java and Burma.

Ceylon is witnessing at the present time an explosive growth of population. The national total grew from 6,053,000 in 1931 to 9,375,000 in 1956; at the time of writing it is well over 10 million, and recent careful estimates suggest that it will double in the next twenty years. The consequences of this explosion represent the major problem before those who are responsible for economic affairs in Ceylon. How are these people to be fed, clothed, housed and employed at present levels of income, let alone at the higher levels that are so patently desirable?

B. H. Farmer is a Fellow and Tutor of St. John's College, Cambridge, and a Lecturer in Geography in the University.

Ceylon's rate of capital formation at first sight appears high by the standards prevalent in underdeveloped countries: gross savings have been estimated as 13.9 per cent of national income for the period 1950-57. But a high proportion of these savings is spent on social welfare and in other ways that contribute little or nothing to economic growth. Mrs Robinson has, for example, calculated that not much more than 50 per cent of the money raised by Government loans is spent on projects that can be reckoned developmental.[1] The failure to apply capital productively is undoubtedly one of the main reasons for the present stagnation in the economy of Ceylon, and is connected not only with the dilemmas that face a democratically elected government in an underdeveloped and service-hungry country but also with a shortage of entrepreneurs. The traditional outlet for savings in Ceylon has been the land, and this is still so. Some investment in land has been and is growth-producing, and a significant part in the development of the tea and rubber industries, and an even greater part in the development of the coconut industry, has been undertaken by Ceylonese capital. But today little expansion into new land is possible, for reasons shortly to be given; and the tendency is for too high a proportion of savings to go into the purchase of already developed enterprises.

It will be readily seen from the preceding paragraphs that Ceylon, though quite clearly an underdeveloped country with many of the problems that go with underdevelopment, departs from norm in a number of respects: notably in its relatively high per capita income, non-agricultural work-force and rate of gross savings. These departures (with others that there is no space to mention) hinge on the large part played in the economy of Ceylon by the three great export crops, tea, rubber and coconuts. Whereas in such countries as India and Pakistan the production of export crops plays a comparatively small part in an overwhelmingly food-producing peasant economy, in Ceylon these crops dominate the economic scene, though not quite to the same extent as in Malaya. Thus while paddy growing, garden cultivation and other forms of peasant food production employed about 404,000 persons in 1946, the growing and processing of export crops employed 783,000 (half of them in the tea industry). These export crops are produced not only on foreign-owned plantations but also on plantations and small holdings owned by Ceylonese. For in Ceylon the cash motive and an export orientation have both permeated whole sectors of the economy in a way that makes nonsense of Myrdal's concept of plantations as foreign-owned "economic enclaves".[2] Almost the whole of the coconut acreage in Ceylon is owned by local people, and the position in the tea and rubber industries was recently as follows:

[1] Robinson (1959).
[2] Myrdal (1957): 53, 58-9.

Category of Ownership	Percentage of Acreage	
	Tea	Rubber
Sterling companies	35.4	13.7
Non-Ceylonese individuals	9.7	2.5
Rupee companies	16.8	13.2
Ceylonese individuals	38.1	70.6

Not all shareholders in "sterling companies", i.e., companies registered in London, are necessarily non-Ceylonese; and not all shareholders in "rupee companies", i.e., companies registered in Colombo, are necessarily Ceylonese. But the figures at least give some idea of the present division of ownership, and give the lie to Myrdal's notion of an enclave.

It can in fact be demonstrated that the production of tea, rubber and coconut is not only responsible for raising the average per capita income, for producing most of the island's gross savings, and for employing most of those engaged in commerce and a high proportion of those employed in industry; the three commodities also provide 90 per cent of Ceylon's exports by value and give a figure for foreign trade per capita totally unrepresentative of an underdeveloped country. Moreover, the needs of the export crop industries have had much to do with the fairly liberal provision in the appropriate areas of roads and railways and for the introduction into Ceylon of banks, insurance companies and other forms of economic institution. But there is another side to the penny: on it is written undue reliance on those commodities and uneven development with the country.

Whatever may be said about peasant food production, technical levels on the best plantations are very high indeed, and are ably supported by Research Institutes, one for each of the three main crops. But not all estates by any means match up to the level of the best, and yields of export crops on small-holdings are generally low.

A final facet of Ceylon's present economy is one that is of great interest to the geographer and ought to be of great interest to the economist. To anyone unfamiliar with the tremendous contrasts in climate that are to be found in suitably disposed tropical islands, the firmness of the reality behind the conventional division of Ceylon into a "Wet Zone" and a "Dry Zone" will not readily be appreciated. The facts, briefly, are these. The Wet Zone of Ceylon covers, roughly, the south-western quadrant of the island (Fig. 1) and rises from a green palm-fringed coast into the central highland mass (Fig. 2). Here rain falls at all seasons, though not evenly throughout the year. The Dry Zone covers most of the rest of Ceylon, perhaps two-thirds of its total area. In most years there is here an abundance of rain from the north-east monsoon between, roughly, November and February: though in occasional years the rains fail. But during the south-west monsoon, from about May to about September, there is a hot, searing, dry season, when rain rarely falls, when shallow-rooted crops fail unless irrigated, and when rivers dry up and become a chain of shallow

pools.[3] The situation in the Dry Zone is made worse by other natural factors, notably the absence or rarity of underground water over most of its area; where the Ceylon Minister of Lands thinks he will find the water for the tube wells he has recently said he will sink is a mystery hidden from the present author.

The bearing of these geographical facts on economic development is that tea, rubber and other economically useful crops need rain at all seasons, and are therefore confined to the Wet Zone (Fig. 1). Since almost all Wet Zone land is either cultivated already, or is too steep, too rocky, too high, or too eroded to be cultivated, there is but little hope of any very considerable extension of the area under tea, rubber or other moisture-loving crops. The case with coconut is rather different. Coconut, it is true, is also moisture-loving, but it is possible to grow it successfully in the Dry Zone where, for various reasons, there is perennial fresh water at no great depth. This means, over most of the Dry Zone, a site where perennial surface water maintains the level of underground water throughout the dry season; which in turn means a site near one of the perennial rivers, or near an irrigation reservoir ("tank") or channel, or near a fresh water coastal lagoon like those of the east coast. Areas over which one or other of these conditions is satisfied are relatively rare, as Government settlement planners ignorant of the simple rules of Dry Zone physical geography have discovered to their peasant victims' cost.[4]

Because of the hostility of the Dry Zone to the money-spinning commercial crops, and because of the prevalence in it before the era of DDT spraying of endemic malaria (itself related to climate), the Dry Zone, outside a few coastal patches of coconut, has remained unaffected by either plantations or by peasant imitation of plantations. In spite of efforts to colonise it during the past thirty years or so, wide expanses of it still remain sparsely peopled, and almost roadless. This contrasts most sharply with the cultivated, densely peopled, well-linked Wet Zone. The contrast between the two Zones cannot be neglected, except at the country's peril, by he who would plan Ceylon's economic future.

EARLY EFFORTS TO DEVELOP CEYLON

The clear implication of what has so far been said is that Ceylon, while underdeveloped, is certainly not undeveloped, though economic development is most unevenly distributed over the face of the island. It has moved a long way from Rostow's traditional static society (though some remote Dry Zone villages, clustered under their coconuts and relying on the products of their irrigated paddy-fields and of their

[3] Farmer (1956).
[4] Farmer (1957): 249-55.

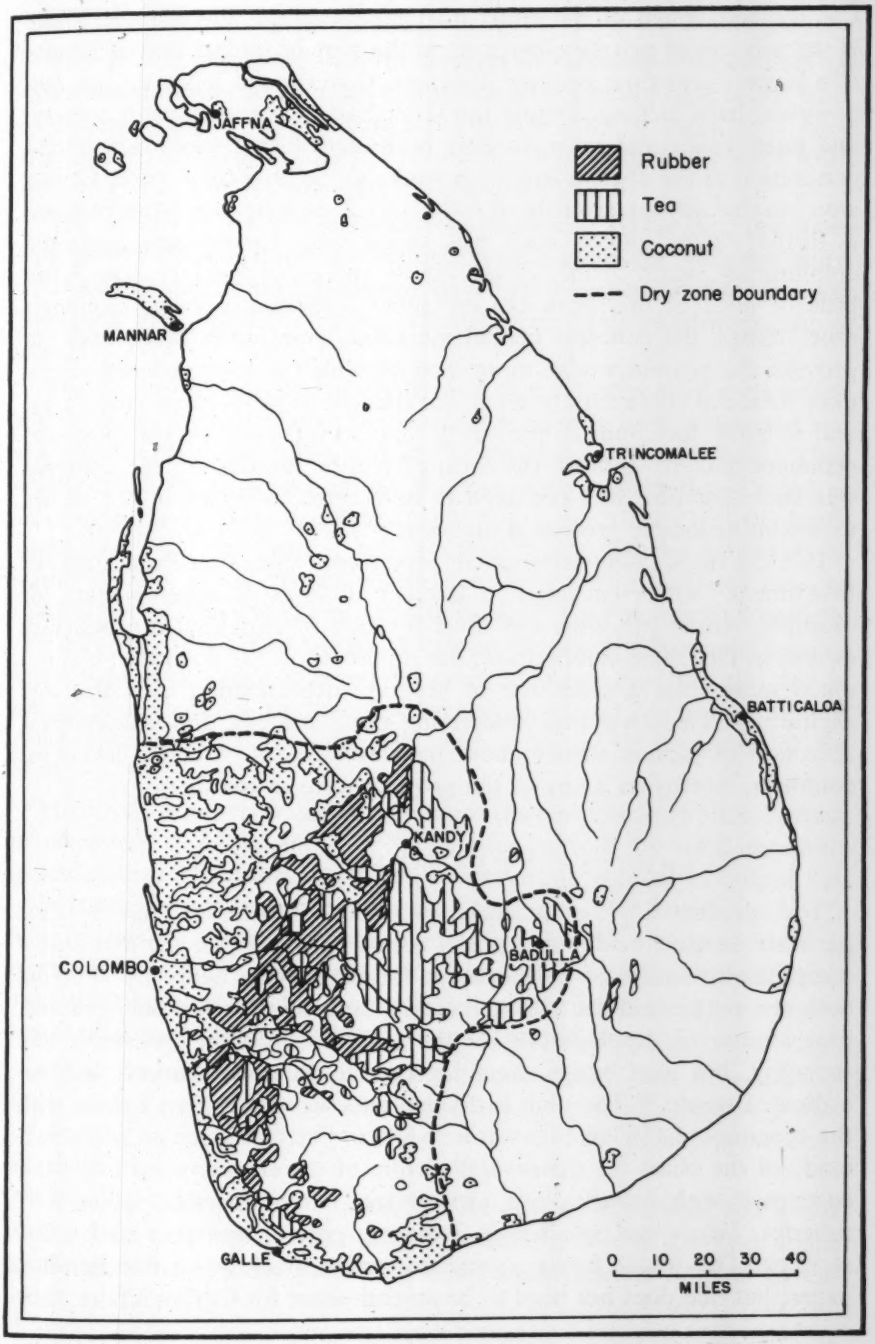

Fig. 1. Ceylon: distribution of major cash crops. Note concentration in Wet Zone of South-west.

patches under shifting cultivation, have not travelled very far thence).[5] Clearly, too, much of the effort that has produced this state of affairs is the product of private enterprise on the part of traders and of plantation owners and their peasant imitators. Government initiative has not, however, been lacking. During the latter half of the nineteenth century, and later, roads and railways were built, and a start was made on the restoration of the ancient irrigation works in the Dry Zone. After Ceylon won internal self-government in 1931, Dry Zone irrigation work received a further fillip, and a start was made with Government-organised colonisation, again mainly in the empty spaces of the Dry Zone.[6] But little or none of this work can be called economic planning. Amongst other things, the concepts behind the effort were purely static ones: to provide the peasantry with more land on which to maintain and reproduce its social character (or what was thought to be its social character), and to grow food, not to provide a fillip to increased productivity and economic growth. Indeed, the form of tenure imposed on the colonists was such that one does not need to be a cynic to regard it as a device to inhibit economic growth at all costs.[7]

In 1954 the Ceylon Government produced a "Six-Year Programme of Investment" which envisaged a number of lines of development: for example, industrialisation and diversification of agricultural production as well as Dry Zone colonisation. But on the whole the document was not much more than a collection of separate departmental estimates and aspirations. There was little underlying grand strategy, and little obvious reflection of current theory about the development of under-developed countries, worthy as many of the projects were in isolation.

THE TEN YEAR PLAN, 1959-68

The preface to the recently published Ten-Year Plan is thus perfectly justified in claiming that it aims to provide "for the first time a comprehensive plan of development for the Ceylon economy covering both the public and the private sectors" and that "it not only presents programmes of development for the several important spheres of the economy, but also brings them together to form a balanced and co-ordinated whole."[8] The plan is divided into two parts: Part I deals with the economy of Ceylon as a whole, while in Part II a detailed analysis is made of the plans for the several sectors of the economy such as those concerned with export crops (wisely put first), domestic agriculture, fisheries, large- and small-scale industry, power, transport and social services. The whole forms a long document of close on five hundred pages; but one does not need to be an enthusiast for Ceylon affairs to be

[5] Rostow (1960). See also Leach (1961).
[6] Farmer (1957): Chapters 5-7.
[7] *Report of the Land Commission* (1958), and Farmer (1960).
[8] *Ten-Year Plan* (1959): iii.

fascinated by it, for as plans go this one is exceptionally well written, well integrated and cogently argued.

One is also impressed with the amount of preparatory work that has gone into the plan. Ceylon has had the benefit here not only of the work of a distinguished home team but also of eminent visitors; a good deal of the preliminary work has fortunately been published.[9] Some years ago, too, the World Bank sent a team to Ceylon.[10]

The authors of the plan are also to be congratulated for their insistence that their proposals must not be interpreted rigidly, but with flexibility, as events unfold during the decade to which it applies; and for the way in which they explicitly invite comments on their handiwork. *Si sic omnes!*

The Ceylon planners have clearly had in the forefront of their minds the explosive growth of population that has already been mentioned and the consequently inevitable growth in the national work-force. They rightly reject the easy and optimistic view, often expressed in Ceylon as in other undeveloped countries, that Western experience will be duplicated and that the current fall in death rates will be followed, as economic and social changes take place, by a fall in the birth rate; so that, in the not very long run, all will be well. They point out forcefully not only that the fall in the death rate in Ceylon has been much more rapid than that which affected Western countries but that this fall is taking place without the changes in economic and agrarian structure which encouraged, if they did not cause a fall in the birth rate in the West.

Moreover, the very rate of population increase is in itself a burden to economic development: for "population growth by itself tends to increase current consumption since an increasing volume of output has to be devoted each year to feeding and clothing the additional numbers", thus necessarily diminishing the possibilities for the saving so vital to economic growth;[11] while at the same time what is available for investment tends to be spent disproportionately on the social needs of a rising population, in the way of schools, houses, and so on.

All of this is, no doubt, very familiar to many. But in a country given to an easy and lotus-eating optimism the planners deserve praise for making it so abundantly clear that these dark demographic considerations have overshadowed all of their work.

Given the demographic context and its obvious economic and social implications it is not surprising that something has to be said about family planning and the possibility of educating public opinion to the

[9] See Selvaratnam (1959); Sundrum, Rao and Selvaratnam (1959); *Reports of Committees and Technical Working Groups* (1959); and *Papers by Visiting Economists* (1959).

[10] See *Economic Development of Ceylon* (1953).

[11] *Ten-Year Plan* (1959): 15.

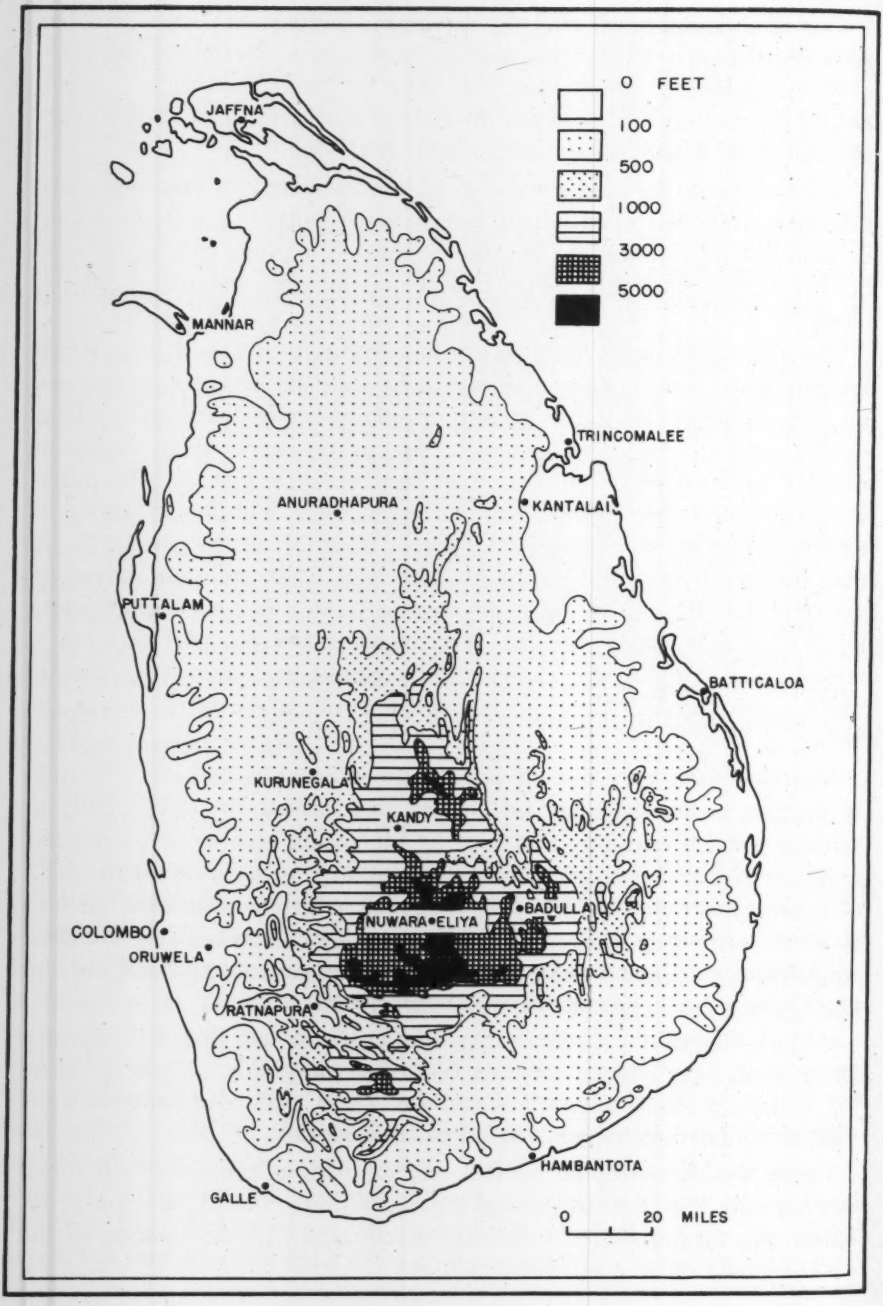

Fig. 2. Ceylon: Relief features.

population problem.[12] It is not surprising, also, that calculations about the future size of the work-force and estimates of the labour absorptive capacity of various forms of economic activity penetrate many sections of the Ten-Year Plan, and that employment is put first among objectives. These are:

"(a) That the plan should aim both at providing employment for the increase in the work-force and at bringing about a certain reduction in existing unemployment and under-employment;

(b) That the plan should as far as possible aim at equilibrium in the balance of payments on current account or at least a limited deficit capable of being compensated for by borrowing and by grants from abroad;

(c) That the plan should aim in the long run at raising the standard of living since this is the ultimate purpose of economic development;

(d) That the plan should provide for the diversification of the economy so as to make it less vulnerable to external changes;

(e) Last, but not least, that the plan should provide for an equitable distribution of national income. . . ."[13]

(so far as objective (c) is concerned, the plan aims at a 17 per cent increase in per capita consumption by 1968.)

If Ceylon's Ten-Year Plan is overshadowed by projections of future population and future work-force, it is also conceived on certain assumptions about other aspects of the external and internal situation. These are:

(1) That during the ten-year period in question there will be no serious international depression;

(2) That the terms of trade will on average be equal to those of 1957;

(3) That outside technical and financial assistance will be forthcoming in sufficient degree;

(4) That the financial and monetary policy of the Government will be geared to the implementation of the plan;

(5) That defence commitments will impose relatively little strain on resources;

(6) That the determined efforts of both Government and people will be forthcoming.[14]

It is possible to conceive that assumptions 1 and 5 are perfectly reasonable (though if communal tension in Ceylon is not eased by some statesmanlike compromise the state of emergency unfortunately prevailing at the time of writing may well be recurrent, in which case Ceylon's internal, rather than its external security may call forth

[12] *Ten-Year Plan* (1959): 16-18.
[13] *Ten-Year Plan* (1959): 60.
[14] *Ten-Year Plan* (1959): 59-60.

expenditure on defence). But it is also not unreasonable to express the view that the remaining assumptions bear the stamp, to greater or lesser degree, of the national failing of optimism. For there seems to be a general set in the terms of trade against primary producers, quite apart from the fact that tea, rubber and coconuts are particularly liable to competition, or to inelasticities of the market, or both; technical and financial assistance from outside will depend on external political factors as well as on political stability in Ceylon, a very doubtful matter; while neither determination to put the plan into action nor hard thinking about it and its implications seem at present to mark the Government and people of Ceylon, with the honourable exception of a number of individuals.

If, however, it is possible to see some of the assumptions underlying the Ceylon Ten-Year Plan as more or less optimistic, it seems that the plan's broad strategy is essentially a sound one. From a quick preliminary survey of the present position and future potential of the island's agriculture, the planners reach the conclusion that:

> "Whatever possibilities still remain in the field of agriculture, it will not afford a permanent outlet for the growing population. Once these possibilities have been exploited to the full there will be no alternative but to develop other avenues of productive employment. In fact these avenues will need to be developed before that date. For even in the earlier phase, the rate of expansion in agricultural employment may well fall short of the rate of expansion in the total work-force."[15]

There can be no doubt at all of the essential accuracy of this judgment, especially if one recognises the high degree of under-employment already in existence in the peasant sector, the great shortage of land in the Wet Zone, and the difficulties and limitations of Dry Zone development.

THE STRATEGY OF DEVELOPMENT

The planners, it will be noted, do not leap headlong into schemes for industrialisation—nor when they eventually and inevitably arrive at such schemes—do they consider them uncritically. Their strategy, broadly, is to achieve progressive and cumulative industrialisation, not by first building up a heavy industry to produce capital goods, but rather by importing these goods. The foreign exchange wherewith to purchase them is to come from an increase in agricultural exports (this in turn involving an expansion of tea, rubber and coconut production), and from reductions of imports of food and consumer goods brought about by increased home production of these commodities.

The case for the development of alternatives to agricultural production (and in practice this means manufacturing industry) is clear from whatever angle one approaches the problem: the limitations on agricultural expansion, the need to get people off the already overcrowded peasant holdings, the dependence of rising living standards on consumer

[15] *Ten-Year Plan* (1959): 26.

goods, the need for forms of production more formative of capital than agriculture, the independence or near-independence of many forms of industry of any single fixed factor like land in agriculture. One of the difficulties is that the creation of industry on the Western model is not particularly labour absorptive. The Ceylon planners have, however, faced this problem, and they envisage what they call "a vigorous supplementary programme for the expansion of small-scale and cottage industries", since these industries are likely to employ relatively large numbers at relatively little capital cost.[16] They also see a vital role for community development and rural self-help, which also serves to use abundant labour rather than scarce capital.

It can also readily be seen that the Ceylon planners have been wise to listen neither to the calls of prestige nor to the tenets of Marxist mythology, and to reject heavy industry as a pre-requisite to industrial development. For Ceylon has no coal nor oil (and cannot have them, given its geological structure); its sources of iron ore, though substantial (they have been estimated at six million tons), are badly scattered and may be difficult of utilisation; and the internal market, at least at present standards of consumption, is too small to absorb the production of an iron and steel industry on a full and economic scale. It should be noted that a steel rolling mill and "iron ore mining and steel smelting" were listed among the projects supplied by the Ministry of Industries to the planners who, possibly pointedly, did not comment on the proposals. It has subsequently been announced (1961) that a steel rolling mill, built with Russian technical assistance, is to be established at Oruwela, near Colombo.

If the Ceylon planners were wise to reject heavy industry as an immediate producer of the capital goods necessary for industrialisation, they were equally wise, (subject to the points to be made in a moment) to recognise the tremendous value to the island's economy of the plantation and export crop industries and not to dismiss them chauvinistically as foreign enclaves or as parasitic on the national economy.

AN OVER-OPTIMISTIC ASSESSMENT?

In a number of respects, however, the plan seems over-optimistic in its assessment of the means by which the broad strategy is to be put into effect. Space forbids a complete review of these proposed means, and in any case many of the matters concerned are highly technical and well outside the author's competence. Let us, however, take one or two fields in which he feels reasonably at home.

It will be clear from what has been said that the export crops have a vital role to play, since they are *inter alia* to replace heavy industry as a means of obtaining capital goods for industrialisation. Something has already been said of the essential soundness of the planners' judg-

[16] *Ten-Year Plan* (1959): 57.

ment that increased exports of tea, rubber and coconuts can only to a limited extent be derived from the opening up of new lands. Most of the planned increase in exports is to come by increasing average yields per acre during the ten-year period: from 697 pounds to 1,119 pounds per acre (an increase of 61 per cent) in the case of tea; from 333 pounds to 493 pounds per acre (48 per cent increase) in the case of rubber and from 2,291 to 2,622 nuts per acre (14 per cent increase) in the case of coconuts.[17] Quite apart from the problem of marketing and of increased home consumption (particularly important in the case of coconut as the population rises) it is possible to doubt whether these figures will in fact be realised. It is true that the best estates already considerably exceed the planned yields, that the yield of tea and rubber at any rate are rising, and that the planners' estimates of increases are much less than the assuredly over-optimistic figures suggested to them by the Department of Agriculture. But in the case of the estates (particularly important for tea and rubber) much will depend on the extent to which owners, Ceylonese or foreign, are willing to invest capital, which in turn depends largely on the estimate they make of the political stability of Ceylon and, so far as foreign owners are concerned, of the prospects for foreign capital. There are few who view the future with complete assurance—though the export crop industries have shown a remarkable resilience so far.

The biggest scope for increased yields of tea, rubber and coconuts lies without doubt in the numerous smallholdings (particularly important in the case of coconuts). But it has hitherto proved very difficult indeed to persuade the smallholder to use improved methods, and it seems certain to many who have studied the problem that one is here up against the diseconomies of small-scale holdings; particularly is this so where replanting is involved—as it must be, notably in replacement of Ceylon's aging coconut palms.

If one passes from the small-holder and peasant as a producer of export crops to the peasant as producer of food crops, one finds even more reason for caution in accepting the future yield estimates of the Ten-Year Plan.[18] The role of the peasant food producer is, of course, not only to grow as much food as possible at home and at competitive prices, but also to release foreign exchange at present spent on food imports and, by diversifying his production, to broaden the base of the economy and to reduce reliance on the outside world for particular commodities.

Rice is naturally the basic foodstuff involved, and it is planned by 1968 to produce 75 per cent of requirements, compared with about 45 per cent in 1957. The plan envisages both an increase in the cultivated area and an increase in yield per acre. As to the former, an additional

[17] The author is indebted to Dr Gamani Corea for clarifying these figures. See also *Ten-Year Plan* (1959): 167-222.

[18] *Ten-Year Plan* (1959): 223-83.

270,000 acres of irrigated paddy is planned; this is an increase of about 25 per cent on the 1954-55 acreage, and is not outside the bounds of possibility, though at a cost, given the increasing difficulties of Dry Zone development. So far as productivity of paddy land is concerned, it is the aim to increase this by no less than 50 per cent (to 48 bushels per acre) and here one is far more doubtful. It is true that given technical methods at present understood by the Department of Agriculture these yields can be achieved and indeed surpassed on suitable soils. But they can only be reached if soil characteristics are known, if fertiliser and lime are suitably applied and if intensive methods of cultivation and high-yielding strains are used. Here one is up against the resistance to change of the Ceylon peasant. Much might be said on this subject, but suffice it to say that this is not mere conservatism, still less stupidity, but is compounded largely of rational doubt, poverty, poor credit facilities, and an extensive attitude to land bred of a situation in which, because there *was* plenty of land, an extensive attitude was perfectly logical. (The author does *not* regard the small size of holdings as a factor here; for there are few if any economies of scale in paddy cultivation.[19]) The planners seem convinced that Ceylon is on the verge of a break-through on the paddy-growing frontier. The author, while recognising that the forces of change are gathering slowly in some of the paddy-fields of Ceylon, is unconvinced that they are yet doing so fast enough or universally enough to have the effects predicted by the planners.

Of the other foodstuffs which it is hoped to grow, *inter alia* to diversify production, sugar is especially noteworthy. The planners rightly point out the extent to which the cultivation of cane sugar has been neglected, though physical conditions appear to be suitable and though large sugar imports are necessary (129,000 tons in 1957, an estimate of 178,000 tons in 1968). Moreover, sugar cane is a labour-intensive crop. The planners boldly envisage 68,000 acres under cane to achieve self-sufficiency in sugar by 1968. It will be most interesting to see whether this ambitious plan will achieve fruition. But it has got off to a bad start, for the factory that has been built at Kantalai, near Trincomalee, was at a standstill in April 1961 owing to shortage of cane. Eighty thousand tons were to have been harvested, but only 20,000 tons were available.[20] This is only enough for 20 days' work at full capacity.

Many other potential crops depend on a solution to the intractable problem of the unirrigable Dry Zone land. Research is in progress but it is still nearly as true as in 1957 that "the problem of maintaining fertility, and even of keeping any soil on the holding at all, is so great that one cannot with confidence say that any device so far exploited can guarantee dry, rotational cultivation of Dry Zone high land in

[19] Farmer (1960).
[20] *Ceylon News*, 6 April, 1961.

perpetuity."[21] To their credit, the planners quote this pessimistic conclusion.

Much might be said, too, of the over-optimism in industrial planning.[22] The planners have eschewed grandiose schemes for heavy industry and have wisely thought instead of a fairly wide range of lighter industries and a supplementary, labour-absorptive programme of small-scale and cottage industries. Many of the industries are *prima facie* suited to Ceylon, especially cement, fertilisers, sugar, textiles, salt, and certain chemicals. It is planned that investment in the "planned sector" of industry will increase from 54.9 million rupees in 1959 to 196.0 million rupees in 1968; and that incentives will also lead to activity in the "unplanned sector". (It is not intended that "planned" and "unplanned" should be synonymous with public and private enterprise respectively.[23]) But one is sceptical both of the managerial capacity of the State (given the problems of existing State industry in Ceylon) and of the venturesomeness of private entrepreneurs.

To sum up, then, the Ceylon Ten-Year Plan, 1959-68, is boldly conceived and strategically has many admirable qualities. If it fails to achieve its targets, it will be because of over-optimism in detail and because non-economic factors, especially political stability, governmental hard-thinking, and social considerations prove adverse.

[21] Farmer (1957): 346.
[22] *Ten-Year Plan* (1959): 345-405.
[23] *Ten-Year Plan* (1959): 348-351.

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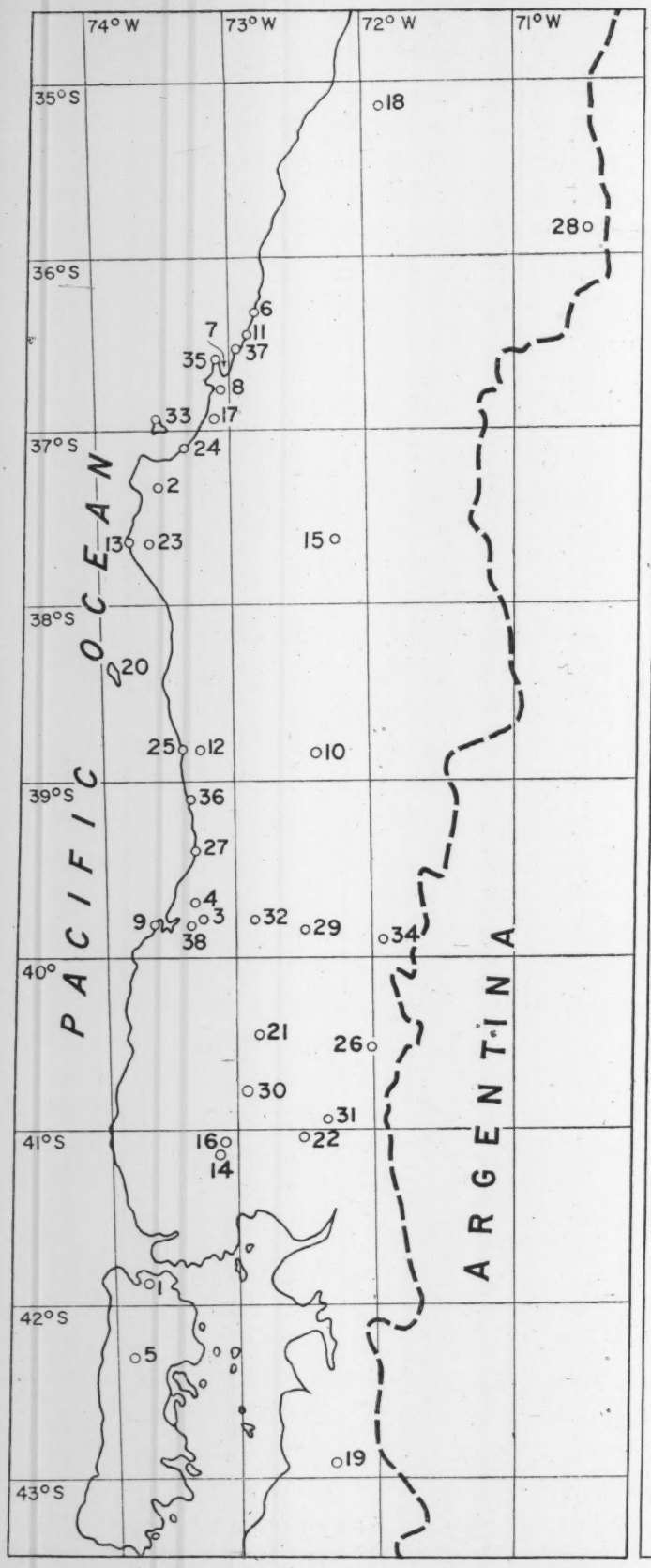


Fig. 1. (a) Location Map.

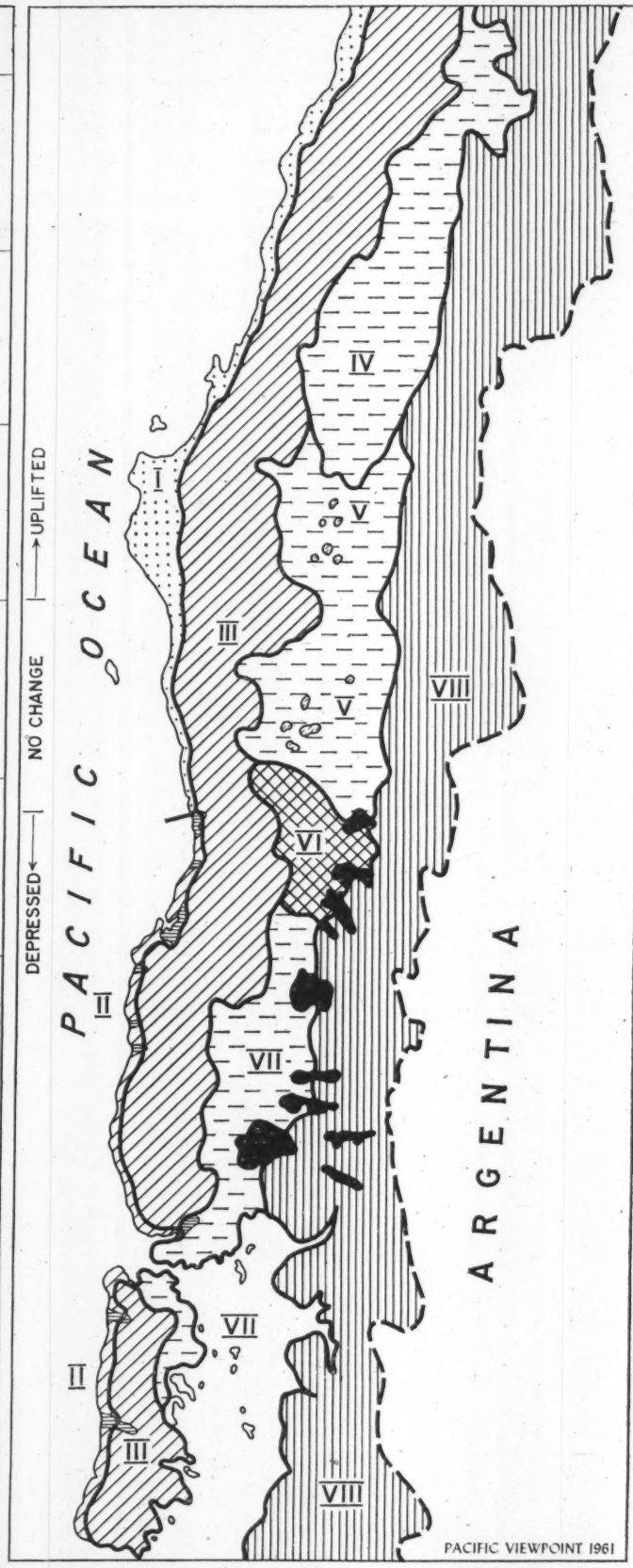
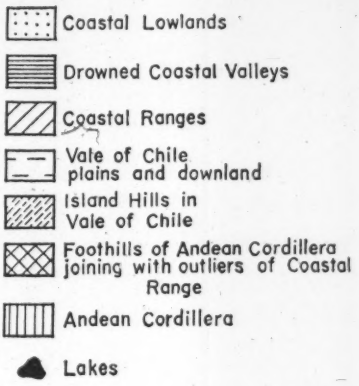


Fig. 1. (b) Broad geographical regions of Chile.


Coastal Lowlands
Drowned Coastal Valleys
Coastal Ranges
Vale of Chile plains and downland
Island Hills in Vale of Chile
Foothills of Andean Cordillera joining with outliers of Coastal Range
Andean Cordillera
Lakes

1. Ancud town
2. Arauco peninsula
3. Calle-Calle river
4. Cruces river
5. Chiloé island
6. Coliumo village
7. Concepcion bay
8. Concepcion city
9. Corral town
10. Cautin province
11. Dichato town
12. Imperial river
13. Lebu town
14. Llanquihue province
15. Los Angeles city
16. Los Pellines village
17. Lota and Schwager—coal mines
18. Maule province
19. Michimávida volcano
20. Mocha island
21. Osorno province
22. Osorno volcano
23. Pehuén village
24. Penco town
25. Puerto Saavedra
26. Puyehue volcano
27. Queule village
28. Quizapu volcano
29. Riñihue lake
30. Río Negro village
31. Rupanco lake
32. San Pedro river
33. Santa María Island
34. Shoshuenco volcano
35. Talcahuano peninsula
36. Toltén town
37. Tomé peninsula
38. Valdivia City

I. COASTAL LOWLANDS North of Lat. 39°S: Littoral region consists of series of elevated bench terraces overlain by coastal drift, and a narrow strip of recent dunes with areas of swamp land.

II. COASTAL REGION South of Lat. 39°S consists of a cliffed shoreline with drowned valleys and small sandy bays near the river mouths.

III. COASTAL RANGES seldom over 3,000 feet in height and often less than 1,000 feet with many gaps where breached by transverse rivers.

IV. VALE OF CHILE North of Lat. 37°S: Central plain with slightly dissected terraces merging with more maturely dissected terrace downland along eastern and western flanks. Evidence of repeated uplift and dissection.

V. VALE OF CHILE between Lat. 37°S and 39°S: Central plain with much less evidence of uplift and dissection. Numerous island hills representing volcanic vents of Tertiary era.

VI. VALE OF CHILE between Lat. 39°S and 40°S: Central plain restricted to relatively narrow valleys and small basins between foothills of Andean Cordillera and outlines of coastal range. No evidence of uplift or dissection.

VII. VALE OF CHILE between Lat. 40°S and 42° 50′S: Central plain occupied by glacial drift and younger alluvial deposits. No marked evidence of dissection but indication of deteriorating drainage conditions on flat land.

VIII. ANDEAN FOOTHILLS AND CORDILLERA with active volcanoes spaced at about 30 mile intervals.

The Earthquake of May 1960 in South-Central Chile

A. C. S. WRIGHT

On the 21st and 22nd of May 1960, severe earthquakes largely destroyed the cities of Concepción and Valdivia, and severely damaged other centres over a wide area in south-central Chile.

The people of Chile have come to accept earthquake and volcanic eruptions as almost a normal feature of their life. Severe earthquakes have been recorded in every century since the arrival of the Spaniards in the sixteenth century and the frequency of earth movements of moderately severe intensity is such that practically every Chilean undergoes an unpleasant experience of this type at least once in his lifetime.[1]

The voyage of the *Beagle* brought Charles Darwin to the shores of Chile in time to experience the severe earthquake of 20th February 1835. The main earthquake occurred near Concepción, but Darwin was in the forest near Valdivia for what he describes as "the most severe earthquake experienced by the oldest inhabitant".[2] A few days later the *Beagle* sailed to Concepción and Darwin was able to see some of the devastation occasioned by the earthquake and tidal waves, and to study phenomena associated with a very recently elevated shoreline. The situation in Concepción was more fully described by Captain Fitzroy.[3] Some 385 years earlier, as recorded by Captain Don Pedro Mariño in *Crónica del Reino de Chile*,[4] Valdivia was destroyed. This occurred on 16th December 1575, only 23 years after being founded by Don Pedro de Valdivia. On this day the nascent city was almost completely demolished by earthquakes and tidal waves, and four months afterwards, in April 1576, it was further disorganised by floodwaters

[1] Viz: 1562, 1570, 1575, 1633, 1657, 1709, 1730, 1737, 1742, 1751, 1786, 1835, 1837, 1874, 1898, 1907, 1928 and 1939—all are years when moderate to severe or severe earthquakes have been recorded in south-central Chile. Valdivia experienced a total of 68 severe tremors between the years 1851 and 1878—an average frequency of two to three per annum. Between 1910 and 1915, Valdivia experienced severe tremors with a frequency between five and 12 per annum. Brüggen (1950).

[2] Darwin (1837).

[3] Fitzroy (1836): 319–31.

[4] Mariño (1865).

A. C. S. Wright is an officer of the Soil Bureau, D.S.I.R., New Zealand, seconded to the Food and Agricultural Organisation, Santiago, Chile.

released when the river San Pedro broke through a huge landslide that had been impounding the waters of Lake Riñihue since the day of the earthquake. Thus the events of 1960 have had close parallels in the recorded history of the past.

REGIONS OF CHILE AFFECTED BY EARTHQUAKES

Looking back beyond the historical records, we can find additional evidence in the landscape and in the soils which suggests that three definite geographic trends are operating:

(1) From Latitude 38°S northwards the coastline of Chile is being subjected to successive or at least cumulative, uplifting.

(2) From Latitude 39°S southwards the coastline is progressively sinking.

(3) Inland, along the foothills of the Andean Cordillera, there are cycles of intensive erosion accompanied by greatly increased building which lead to the periodic formation of debris cones at the heads of the lakes.

The area seriously affected by the most recent seismic disturbances extended from the Province of Maule (latitude 36°30′S) to the southern tip of Chiloé Island (latitude 43° 50′S). Within these latitudes fairly marked earth movements occurred over the whole width of the Republic, and were also felt on the other side of the Andes in Argentina. A total area of more than 100,000 square miles was involved.

Between the latitudes mentioned above, the landscape of Chile (see Fig. 1) comprises:

(1) *A coastal range,* of an average width of about 30 miles, with a strip of coastal lowland on the western flank extending south as far as latitude 39°50′S. Further to the south the Pacific littoral consists mainly of cliffed shorelines with occasional sandy bays in the vicinity of drowned river mouths.

(2) *The Andean Cordillera* of high mountains with their attendant foothills. Here are found deep glacial valleys and large lakes, the latter occurring only to the south of latitude 39°S. In this section of Chile, the Andes reach a mean elevation of about 5,250 feet, with some passes as low as 2,500 feet and isolated peaks attaining over 8,000 feet.

(3) Between the coastal range and the main cordillera, there is a region of much lower elevation (150–800 feet), some 380 miles in length, and of an average width of 45 miles. This lowland is usually referred to as the Vale of Chile. This is, however, by no means a valley in the normal sense; it is simply the depression

between the coastal range and the Andean Cordillera, partly infilled by old marine and lacustrine sediments, various kinds of glacial outwash, fluvial materials dumped by rivers draining from the Andes, with included beds and superficial deposits of volcanic ash and volcanic loess. These materials, in places, attain considerable thickness; for instance, near Chillán, the materials infilling the Vale of Chile are more than 1,000 feet in thickness. North of about latitude 38°S, this Vale of Chile takes the form of a central plain flanked by broad terraces representing old land surfaces of various ages in progressive stages of dissection. In many places there is evidence indicative of at least four periods of erosion, alternating with four periods of intense accumulation. Materials belonging to the first period of accumulation are now to be found as a capping over the less elevated sections of the coastal range, at altitudes of up to 1,400 feet above present sea-level. South of latitude 39°S, the character of the Vale of Chile changes markedly. In this region, spur ranges from the foothills of the Andean Cordillera extend westward across the lowlands almost meeting the eastern outliers of the coastal range which here reaches its widest extent (about 40 miles). Between these hills, the lower-lying part of the landscape is built up of thick layers of glacial outwash deposited in fluvial and lacustrine patterns, interspersed with ancient beds of volcanic ash, some of which are water-deposited, but others of which are clearly of sub-aerial origin. Accumulative materials of this type extend as far as the north-eastern corner of Chiloé Island, and similar deposits may once have filled the upper part of the Gulf of Reloncaví. Throughout its length, the Vale of Chile is traversed by rivers flowing westward from the Andes to the Pacific Ocean. Scale transects between the Andean Cordillera and the Pacific coast for latitude 36°30′S, 38°S and 40°30′S are shown in Fig. 2.

The geological pattern of this part of Chile is comparatively simple. The coastal range is formed mainly from metamorphosed sediments of Paleozoic or Precambrian age, chiefly mica-schists but including shales, slates, phyllites, and some gneiss. North of latitude 38°S, the coastal range is in part formed of granitic rocks considered to be of Middle or Upper Cretaceous age. On the other hand, the Andean Cordillera is formed mainly of Tertiary and Quaternary andesites and basalts, with considerable areas of Jurassic and Cretaceous indurated sediments resembling the greywacke of New Zealand, forming the foothills north of latitude 39°S. Granite rocks are also found in the Andean Cordillera but occur mainly south of this latitude. On the coastal lowlands, the peninsulas of Arauco and Tomé are formed mainly from Lower and Middle Tertiary marine sediments which contain coal seams. However, the various marine sediments (of diverse Cretaceous, Tertiary and

Pliocene ages) are of relatively minor importance in this part of Chile. Island hills representing old volcanoes formed by basaltic eruptions in the Pliocene occur occasionally in the central part of the Vale of Chile between latitude 37°S and latitude 39°S, but present-day volcanic activity is confined to the chain of volcanoes located high in the Andean Cordillera.

The more obvious fault lines all run more or less parallel to the coast on both western and eastern flanks of the coastal range, while others, less distinct, parallel the foot of the Andean Cordillera. In addition to these there are some obvious lines of weakness within the Andes following the alignment of the volcanoes and the various hot spring locations interspersed between them. Transverse faults, running west to east between the coast and the Andes, almost certainly do exist, but few have as yet been identified with certainty. It is noteworthy that the seismic activity of 21st and 22nd May 1960 caused no obvious displacement of any of the major known faults, even those under close observation, such as those of the coal mines of Lota and Schwager,[5] to the south of the city of Concepción.

THE EARTHQUAKES OF MAY 1960

The most recent period of seismic activity was initiated at 6.02 a.m. (10.02 G.M.T.) on 21st May,[6] when an earthquake of grade 7.75 on the Richter scale (grade IX on the Cancani-Mercalli-Sieberg scale) caused extensive damage to life and property in the city of Concepción, and over the whole coastal region between Penco and Lebu, extending inland as far as Los Angeles, where a force of VII on the CMS scale was registered. The epicentre of this earthquake is considered to have been about 50 miles west of the Arauco peninsula. The shock was clearly felt in Santiago, but was of light intensity, although of fairly long duration. At the time of this movement the coastline between Lebu in the south and Dichato in the north underwent elevation, reaching a maximum of about four feet in the case of the Arauco peninsula. Similar elevation is reported from the offshore islands of Santa María and Mocha.[7] On the island of Guafo, some areas were reportedly elevated as much as nine feet.

Apart from a brief abnormal surge in the sea reported from Talcahuano, no tsunamis or other unusual tidal phenomena were associated with this first earthquake. Almost all the damage to property was produced by changes in the state of unconsolidated sediments below buildings. Changes were usually in the nature of compaction of weak layers in the subsoil, and the sliding of mobile subsurface layers into

[5] Watanabe (1960).
[6] Figueroa (1960.)
[7] Watanabe (1960).

lower–lying positions. Landslides of major size were comparatively rare, the only serious one being at Pehuén, in Arauco Province.[8]

On the following day, 22nd May, at 3.10 p.m. (19.10 hours G.M.T.) the provinces of Chiloé, Llanquihue, Osorno, Valdivia and Cautín were severely shaken by an earthquake which reached a magnitude of 7.5 on the Richter scale. The epicentre of this movement was also in the Pacific Ocean, somewhere west of the island of Chiloé. Within 30 seconds a longer and more severe earthquake occurred with an epicentre which is calculated to have been about 95 miles west of the city of Valdivia, approximately in latitude 39°S and longitude 73°30′W, a region where the ocean has a depth of between 1,500 and 2,000 fathoms. In Valdivia City this earthquake reached a maximum magnitude of 8.5 on the Richter scale (X on the CMS scale). (Earthquakes of this rating are classed as "highly destructive", with shockwaves reaching an acceleration of between 1,001 and 2,000 mm/sec.^{2})

During the earthquakes of 22nd May, the coastal regions from Puerto Saavedra southwards experienced considerable geographic alteration. South of Toltén the whole coastline suffered a depression of between four feet and six feet and the sea immediately began to flow inland across the alluvial bottomland of the transverse valleys. Following closely on this, the coastline was assaulted by tsunamis, which ranged from two to 10 in number, and varied in amplitude from six feet to 50 feet, depending upon the configuration of the shore line and the slope of the coastal shelf. These tsunamis travelled across the Pacific, reaching the shores of Hawaii, Japan and New Zealand, travelling at a velocity computed to be between 400 and 800 miles per hour. In Chile the tsunamis caused heavy loss of life and destroyed practically all the coastal settlements and port facilities between Coliumo in the north and Ancud in the south, with the exception of those in the Bay of Concepción which was protected by the Talcahuano peninsula. At Corral, the former port for Valdivia, the first tsunamis arrived within 10 minutes of the main shock.[9] At Ancud, in the south, the tsunamis arrived from a north-westerly quarter about 18 minutes after the main earthquake;[10] while at Coliumo, in the north, they arrived almost an hour after the earthquake and were of relatively minor amplitude but nevertheless caused very extensive damage owing to the configuration of the coastline.

In these coastal settlements buildings are normally constructed of wood. Those nearest the shore were set afloat or overturned and the resulting debris battered and destroyed buildings further inland. In many places the ameliorating effect of a belt of trees or even a well-established hedge was very noticeable. In areas where the land had just

[8] Watanabe (1960).
[9] Watanabe (1960).
[10] Galli (1960B).

previously sunk the slow inflowing of the sea across the landscape provided the inhabitants with sufficient warning to allow them to flee to the nearby hills, but in Queule and other localities where the tsunamis arrived quickly there was considerable loss of life amongst those on the land as well as those who had taken to the sea for safety. To the north of Toltén, where the land did not alter markedly in elevation during this earthquake, the waves arrived with little prior warning.

When the waves receded, the farmland nearest to the coastline was left strewn with debris; cultivated fields had the topsoil eroded, and everywhere fences were destroyed and livestock carried away. In places where the coastal plain was partially protected by sandspits or dunes the waves carried sand inland and deposited this over farmland. In districts where the coastal plain is of undulating relief the depressions were left filled with salt water which subsequently killed pastures, crops, and later, trees, Yet these troubles were relatively minor compared to those that affected farmers in areas where the coast had actually suffered depression prior to the arrival of the tsunamis. Here the waves advanced up the valleys of the rivers for a distance of up to five miles inland, sweeping away or severely damaging farm installations along the valley sides. Here, when the waves receded, a good part of the valley floor was left permanently inundated, occupied at first by seawater and subsequently, by admixture with river water, with brackish water which is still subject to tidal movements of considerable amplitude (Fig. 4).

All along the coast, tsunamis changed the configuration of the sandspits and sand bars near the river mouths, almost completely blocking some rivers. In only a few cases was there produced an improvement in the outlet of rivers. In the case of the Río Imperial, a river in Cautín Province, the movement of sand into the actual mouth of the river was severe enough to produce an immediate rise in the level of the river owing to water becoming backed up for many miles upstream.

In certain districts where the coastal plain is formed of consolidated dunes and is of undulating relief some depressions have, over the years, become filled in by the accumulation of organic residues. The shaking of the earthquake caused a consolidation of the lower, most decomposed, layers of this peat, causing a local lowering of the surface of the land (Figs. 7, 8). Many of these depressions have now become fresh-water lagoons and presumably in time will again fill with organic residues. This local sinkage phenomenon is more conspicuous to the north of Queule, where the actual level of the whole landscape was not depressed during this earthquake. To the south of Queule, where the land appears to have sunk on previous occasions, many peat-filled depressions show stratification, the peat being interspersed with layers of marine clays and sandy alluvium deposited during previous ingressions of the sea. These stratified organic beds are not consolidated as easily as the unstratified peats of the northern part of the coastal plain, yet in several

places some additional consolidation has clearly occurred during the recent earthquake. In many places along the southern section of the coast where alluvial land is now permanently inundated it is impossible to be sure how much of the inundation is due to general sinking of the land and how much due to local consolidation of organic layers in the subsoils. To the hard-pressed owners of the land this may appear to be somewhat of an academic question, of little significance alongside their pressing need to salvage what they can of their drowned assets. Yet it is obvious that reclamation schemes will have to take into account this extra factor.

Most inland centres of population were affected by the earthquakes of 22nd May and suffered considerable damage to property, but fortunately loss of life was comparatively small. This was partly due to the fact that the events of the day before had to some extent alerted the population throughout Chile, but also in a large measure was due to the fact that the second disaster occurred in the mid-afternoon, on a day when most of the population were abroad in the streets celebrating a public holiday—the day of Admiral Arturo Prat, hero of the naval battle between Chile and Peru in 1879. Of all the populous areas in south-central Chile by far the worst affected was the city of Valdivia, where at least 60 per cent of the buildings in the centre of the city were destroyed or severely damaged. Valdivia is located a short distance inland from the sea at a point where the river San Pedro, carrying the effluent water from a system of large inland lakes, breaches the coastal range. The site is a gently undulating one, ranging from 10 to 50 feet above sea level near the bank of the river Calle-Calle (the name given to the lower reaches of the river San Pedro). The city is located opposite the confluence of this river with the river Cruces. The substrata on which most city buildings have been constructed are either recent alluvial materials or Quaternary sediments consisting of weathered gravels, sands and clays, and, in the higher parts, weathered mica-schist. Undulations in this terrain have been filled in with soil and other debris to form the almost level foundation of the city. This latter type of fill permitted very uneven displacement and many buildings were completely destroyed; but it is also true that most of the natural substrata materials reacted badly during the earthquake. Internal packing and lateral slidings were responsible for most of the displacement of buildings in Valdivia.[11] Indeed, this observation applies widely in towns throughout south-central Chile. In some localities even the partially weathered Quaternary gravels underwent considerable displacement, particularly when located near steeply sloping margins of rivers or lakes. In many cases instability was clearly associated with the presence of groundwater at levels near the surface, but in other cases instability

[11] Doyel (1960).

appeared to be due to the presence of beds of weathered volcanic ash interbedded amongst the gravels. These ash layers have weathered to the stage which they are rich in allophane, a type of clay that is fairly stable when dry, but which can absorb a very large amount of water, which is subsequently expressed when agitated under pressure producing a remarkable phenomenon resembling liquefaction. During the earthquake, the material in these ash layers becomes "liquefied", thus removing support from the gravel beds above and allowing them to fracture. Blocks of the latter were thus enabled to slide laterally, *en masse,* into gulleys, rivers or lakes. Movements of this type were particularly noticeable in towns located on landscapes formed by dissection of terraces composed of gravel beds interlayered with ash beds, as happened in the case of the town of Rio Negro, where destruction of buildings was very severe.

On the other hand, similar beds formed of weathered gravels interbedded with volcanic ash generally proved to be stable where they occurred on undissected landscapes, where there is less scope for lateral movement. More recent and much less weathered beds of gravels, consisting mainly of loose and rounded materials, seem to have absorbed the earth shocks much more successfully. In some places (e.g., Los Pellines) even heavily and unevenly loaded storage barns survived with only minor damage. Beds of sand generally proved to be fairly stable as building sites if the sands were in a dry condition at the time of the earthquake, but in cases where lower levels of the sand beds were saturated with water, quite severe damage occurred.

The newly constructed cement-paved sections of the Pan-American or "Longitudinal" highway resisted damage fairly well, and road traffic was interrupted by the earthquake mainly because of the collapse of sections of earth fill used to form approaches to bridges. The bridges themselves usually escaped damage. A few short sections of road were actually thrown out of alignment, but the cause was in almost every case the displacement and consolidation of filling material deficient in gravel or with too high a proportion of clay soil. In some of the worst examples the filling material contained a high proportion of volcanic ash soil very rich in allophane clay, a material which thus demonstrates its unsuitability for highway construction purposes. The permanent way of the railroad was locally fairly seriously displaced, and rail traffic in Llanquihue province had to be suspended for several weeks.

Some of the worst cases of damage to life and farming property occurred in the Andean foothills, where agricultural endeavour has been steadily spreading upward from the lowlands on to the steep hillsides of the cordillera. Damage of this type was severe in the foothills near Lake Rupanco. In their natural condition these slopes were covered with dense forest, established on soils formed of material built up by recurrent showers of volcanic ash. Intentional or accidental destruction

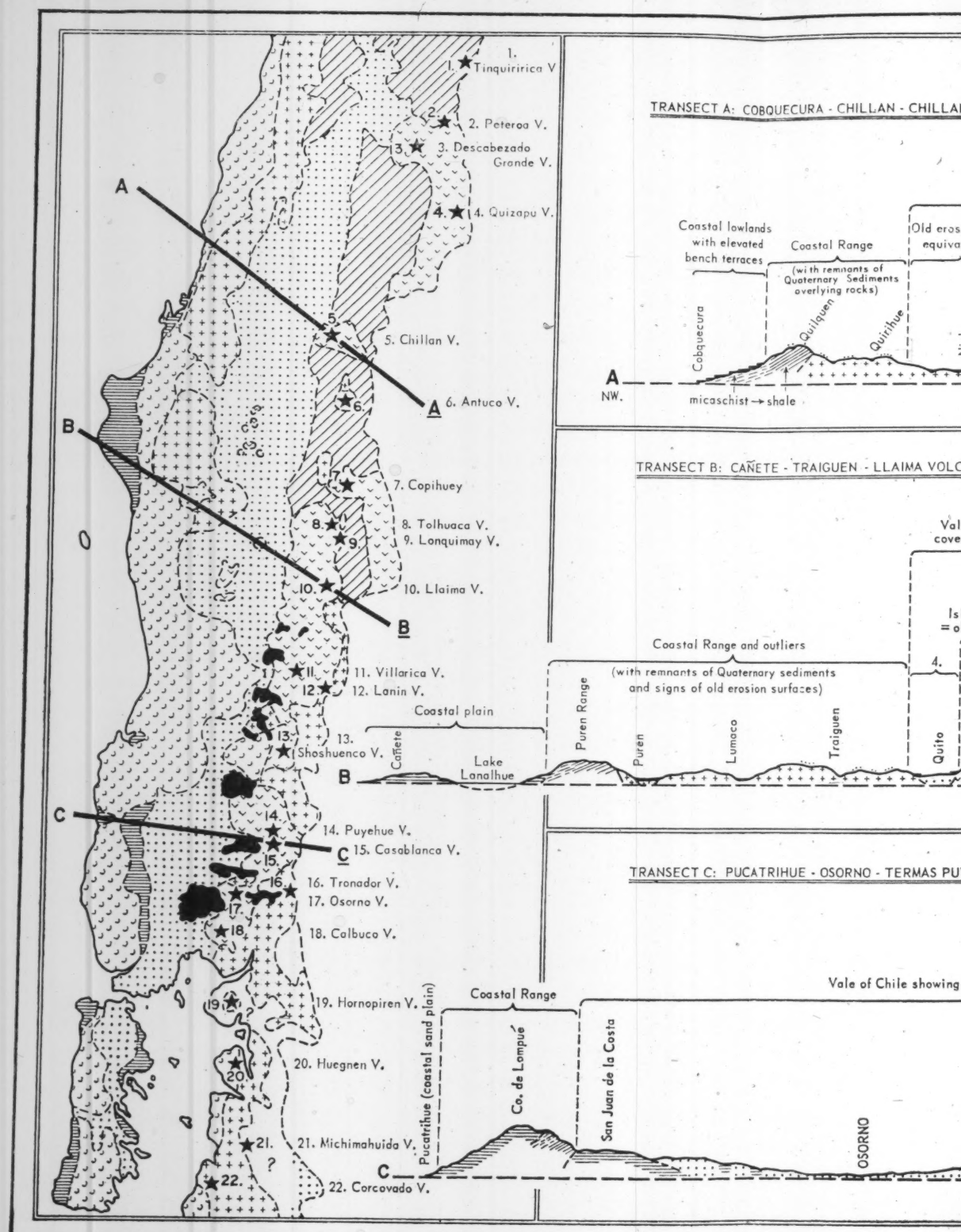
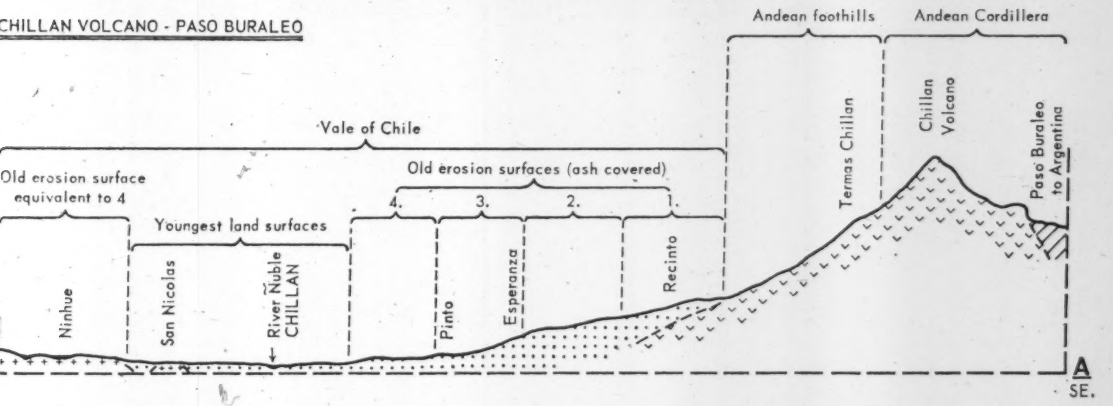


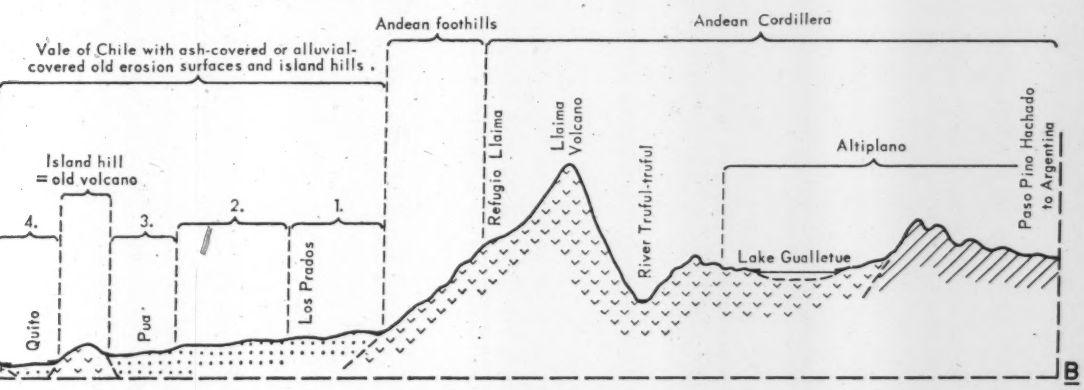
Fig. 2. Generalised geological sketch map of South-Cen

Scale of transects: Horizontal: 1 inch: 16 miles
Vertical: 1 inch: 8000 feet

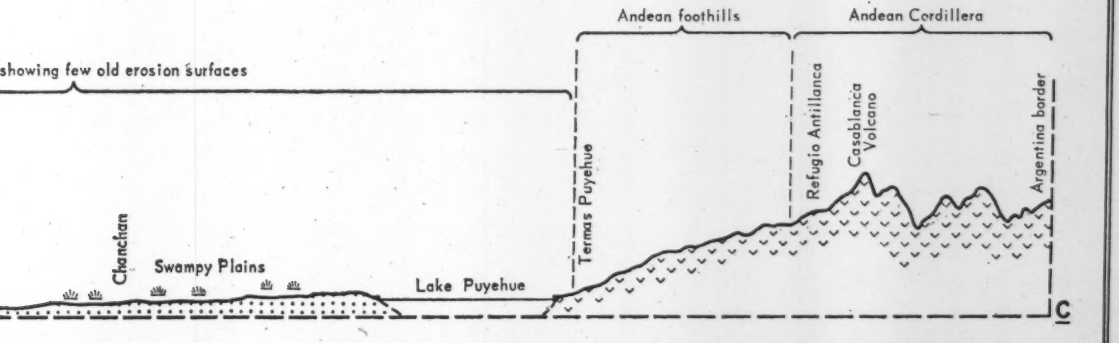
CHILLAN VOLCANO - PASO BURALEO



A VOLCANO - LAKE GUALLETUE - PASSO PINO HACHADO



MAS PUYEHUE - CASABLANCA VOLCANO - ARGENTINA BORDER



Geological data after Brüggen - transects original

Cretaceous and Jurassic indurated sediments (Vulcanite, porphryte etc.) with some intrusive andesite and granite

Cretaceous granitic rocks

Paleozoic and Pre Cambrian - mainly micaschist; some shales, slate, phyllites and gneisses

★ Main Volcanic Cones

PACIFIC VIEWPOINT 1961

h-Central Chile and three transects drawn to scale.

of the indigenous forest cover has resulted in a high degree of instability, and minor landslides are a regular occurrence on farms located in these foothills. Instability is especially marked on slopes where the former forests were of a shallow-rooting type (e.g., those dominated by *Aextoxicon punctatum,* "Oliviloo", and *Eucryphia cordifolia,* "Ulmo") and on slopes where the soils are formed by thick beds of scoria and pumiceous ash, separated by thin layers of fine andesitic dust now weathered to a stage rich in allophane clay (Fig. 5). At the time of the earthquake on 21st May, successive earth shocks precipitated landslides on a grand scale in the areas of greatest instability, sweeping away farms and farmers into the depths of the lakes. These landslides were, in reality, veritable debris avalanches, formed of a mixture of soil, trees, and rocks plucked from the hillsides. In places where they were not able to discharge directly into lakes as in Fig. 6, the descending debris reformed on reaching the lowlands, forming a type of mud-flow (Fig. 3), which swept across and engulfed other farmland at the foot of the slopes, at a speed observed as being "faster than a horse could gallop".

The lubrication for the high velocity of these debris avalanches and mud-flows undoubtedly came from water held in the porous scoria and pumice, water which was expressed by the weight of the descending mass. Expressed water also filled the air as a fine mist which did not disperse for several hours, producing an untimely fog which further confused the survivors of the catastrophe. Subsequent examination of unstable steepland soils in sites which had not suffered complete erosion during the earthquake (Fig. 5), showed that much of the initial weakness of the soil mantle lay in the allophane-rich horizons of the soil. These layers had partially "liquefied" and allowed the soil to begin sliding, and probably subsequently contributed to the high initial velocity achieved by the moving mass. Landslides of this type almost completely destroyed whole farming settlements, and by the destruction of roads and the blocking of rivers, isolated many more. Helicopters proved invaluable in locating survivors and in delivering small quantities of essential supplies to isolated communities.

The most serious of these landslides occurred in the San Pedro valley near the egress of this river from Lake Riñihue. In this lightly populated region no lives were lost at the time of the massive displacement of material in the cliffs along the north side of the river valley, but, as had happened 385 years earlier, the waters of Lake Riñihue (and all the water in an extensive system of intercommunicating inland lakes) were impounded behind gigantic debris barriers, thus forming a constant threat to the people in the scattered farms of the San Pedro valley and the more heavily populated Valdivian lowlands below. The northern face of the valley wall collapsed in three places, and thus the blockage was in three sections, that furtherest downstream being the largest and

nearly a mile in length. After an initial survey to establish levels, engineers laboured valiantly through two months of atrociously wet weather which rapidly augmented the water impounded in the lake until it reached to over 35 feet above normal level, digging through the debris in order to release the impounded water under some sort of control. At the end of July this task was completed. As a precautionary measure population and livestock were evacuated from low-lying parts of the San Pedro valley and from the lower sectors of the city of Valdivia before discharge of the water commenced. During the discharging process severe flooding occurred in these lowlands, but the amount of silt left behind when the waters receded was comparatively small. In the upper reaches of the valley almost no alluvial material was deposited. Actually, deposition of silt and sand may well have been very heavy during the first three days of the discharging period while the earth barriers were eroding, but during the last three days the swollen river was charged with lake water almost free of sediment and the speed of the current was such that most of the sediment that may have been deposited earlier would have been swept away. Indeed, during the final phase, considerable erosion occurred in the river bed and many small islands in the river were partly washed away. Farmers in the valley suffered more from erosion and from destruction of fences and outbuildings than from the heavy deposition of alluvium which had been feared.

The cause of the Riñihue landslips is not known for certain, but it is noteworthy that the thick beds of glacial outwash, which here are composed mainly of sands and gravels, also contain layers of volcanic ash weathered to the stage where they are rich in allophane clays. Thus the same element of instability is present here as was found in the case of the other major landslip areas of the cordillera.

At the time of the May earthquakes only minor volcanic activity was observed. Darwin several times mentions volcanoes which he observed in eruption during his year in Chile, although some of these eruptions antedated the earthquakes in Valdivia and Concepción. During the present period of seismic activity only one volcano, a small cone known as Cauye, parasitic on the side of the larger volcano Pueyhue, burst into violent eruption at 3.15 p.m. on 24th May, two days after the severe earthquake phase. For six days this volcano erupted pumiceous ash and stones, most of the heavier material falling within a radius of eight miles of the vent and much of the finer ash being carried over the Andes into Argentina by the strong westerly winds prevailing. Only a fine film of grey dust fell on the lowlands of Osorno province during this eruption. Minor activity was reported at about this time from a more northern volcanic centre dominated by the volcano Shoshuenco, but the extent of this activity has not been confirmed. A volcano, El Tupungato, even further to the north, in latitude 33°S, was photographed in eruption

Photo: A. Mella

Fig. 3. Debris of farming settlement of Gaviota, at the head of Lake Rupanco, overwhelmed by mud-flows and debris avalanches on 21st May 1960.

Fig. 4. Lowland permanently flooded by the sea due to subsidence during the earthquake of May 1960. "Los Boldos" Estate, near Toltén, Chile.

Photo: A. C. S. Wright

on 8th July, but this eruption also appears to have been of short duration.[12]

IMPACT ON THE ECONOMY

The Chileans of the regions affected by this combination of earthquakes, tidal waves and volcanic eruptions were stunned at first but remained remarkably calm. Within a few days efficient evacuation by sea and air was operating, with Santiago as the main receiving centre. The aboriginal population, who are mainly of Araucanian stock and who exist as small farmers and fishermen in the less developed areas north of Valdivia, were naturally perturbed and revived ancient rites to placate the forces at work and subsequently staged other ceremonies to give thanks when the worst was past, but for many people life returned to almost normal conditions in a surprisingly short time. Technicians and engineers rose admirably to the occasion, and in an amazingly short time the road, rail and telegraphic communications between all but the most southern centres were functioning. The value of helicopters (many of which were loaned by Argentina) was amply demonstrated when, despite extremely unfavourable weather conditions, they repeatedly flew missions over very difficult terrain. The rural and urban police force—the "Carabineros de Chile"—showed outstanding efficiency and initiative, as did also the Army, Navy and Air Force units transferred into the devastated areas. Almost immediately planes began arriving in Santiago with urgently needed supplies donated from all over the world and many of the planes remained for a time to assist with evacuation. At the time of writing, four months after the first earthquake, most of the evacuees have returned to their home centres, leaving only a small (but inevitable) residue to intensify the already urgent problems of urban overcrowding in Santiago.

For the larger landowners and farmers the weeks immediately following the earthquakes were a sad period—a time for counting losses. For the lower income groups of the rural population these were undoubtedly weeks of added hardship but their losses were proportionately lighter and, as emergency programmes developed, this period brought a wealth of new experiences. For some of those in this group it brought a realisation of better living conditions and more varied nutrition, hitherto only imagined. New homes and new schools are now being erected in rural areas long neglected for lack of funds, and for many people, in

[12] Renewed volcanic activity during periods of seismic disturbance is quite frequently observed in Chile. Chillán volcano burst into eruption on the same night in 1906 as the great earthquake of Valparaíso and Quizapu volcano erupted during the earthquake of Talca, in 1928. Osorno and Michimávida volcanoes erupted just prior to the earthquake experienced by Darwin in 1835. Brüggen (1950).

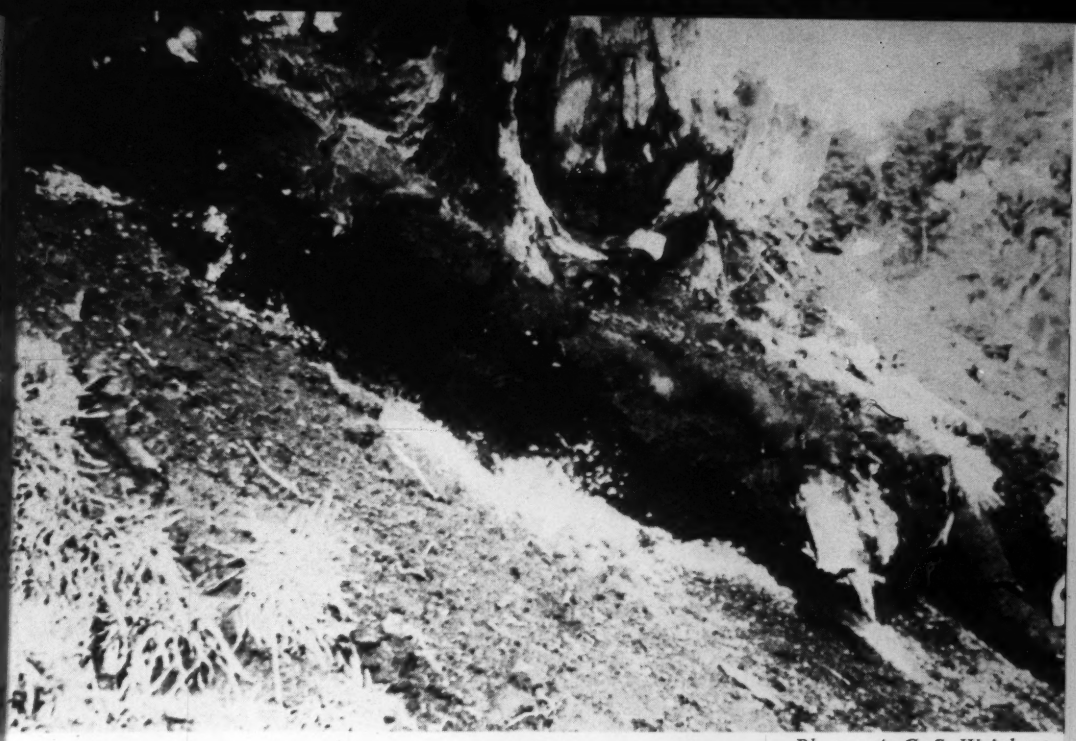


Photo: A. C. S. Wright

Fig. 5. Shallow rooted ulmo (Eucryphia cordifolia) trees growing in recent volcanic ash overlying pumice beds. Rio Blanco settlement, Lake Rupanco, Chile.

Fig. 6. The former site of Gaviota settlement, Lake Rupanco, Chile, swept bare by debris avalanches set off by the earthquake of 22nd May 1960.

Photo: A. Mella

the long run, the earthquake may prove to have been somewhat of a blessing come in curious guise.

The chief damage to the Republic has unquestionably been in the field of economics. The damage to, and loss of production from, manufacturing plants, total destruction of some small industries, severance from sources of raw materials, and difficulties in securing replacements for damaged parts, are all things that cannot be made good in a day. The economy of Chile, moreover, is in no condition to tolerate any prolonged loss of internal production. This is particularly true of primary production—the field wherein lies the real development potential of the country. In this field there have been severe setbacks owing to disablement of processing industries, interruption to communications, to supplies of potable water, electricity, and so on. However, the actual soil resources of Chile have suffered relatively slight permanent damage, as Table 1 shows.

TABLE 1

Approximate Areas of Soils Lost or Modified as a Result of Seismic and Associated Disturbances of May-June 1960

Category I Totally Destroyed	Total Area Affected (hectares)	Area Suited to Agr. Production (hectares)
Permanent inundation by seawater		
Soils in an advanced stage of agricultural development	12,000	12,000
Soils in initial process of agricultural development	20,000	20,000
Undeveloped soils	8,000	4,000
Plunged into deep lake water		
(*N.B.* These were mainly steepland soils unsuited to agriculture, but the total includes some partially developed hill soils)	20,000	700
Total	60,000	36,700

Category II Partially Destroyed or Considerably Modified	Total Area Affected (hectares)	Area Suited to Agr. Production (hectares)
By landslides, debris avalanches, slumping, etc.	15,000	1,500
By mudflows	500	400
By development of saline water-table surface	1,500	1,200
Total	17,000	3,100

Photo: A. C. S. Wright

Fig. 7. Fissures produced in alluvial soil by compaction of the underlying organic deposits during seismic oscillations, Toltén District, Chile.

Fig. 8. Fissured ground marking the limit between alluvium deposited over gravels and the same material deposited over organic debris of a former swamp (foreground). The organic residues have compacted during the seismic oscillations and the level of the surface of the land in the foreground has fallen about 5 feet.

Photo: A. C. S. Wright

Category III Slightly Modified	Total Area Affected (hectares)	Area Suited to Agr. Production (hectares)
By salinisation during temporary immersion in water	23,000	11,500
By addition of veneer of coastal sand	800	700
By addition of pumiceous volcanic ash:		
Between 1 cm and 5 cm in depth	35,000	18,000
More than 5 cm in depth	22,000	3,000
By permanent rise in level of groundwater	17,000	10,000
By temporary flooding by lake waters	13,000	8,000
By minor displacement (slumping, minor slips)	3,000	900
Total	113,800	52,100

Agricultural reconstruction is mainly taking the form of ample long-term credit to enable the rebuilding of destroyed or damaged farm buildings, replacement of fences, reconstruction of drainage and irrigation systems, etc., as well as loans for seed, fertiliser and machinery necessary for the general improvement of agricultural production. The worst-hit farmers were those of the coastal lowlands, where many have lost all or part of their land to the sea or to river water. Some of these farmers who have lost all but a small fraction of their fertile alluvial land are now faced with the need to reclaim what they can of the inundated area, and will have to attempt development of their less-fertile hill soils. In many cases reclamation of inundated land may have to be abandoned because of the high costs involved, and some farmers may have little alternative but to seek some financial assistance in order to purchase new properties elsewhere. There are still considerable areas of relatively inexpensive land in Llanquihue and Osorno provinces with soils that need but a little additional clearing, draining and fertilising to make them into good and productive farmland. Some small local reclamation schemes appear feasible, but one of the main difficulties in the way of accepting small, purely local schemes for reclamation of areas of inundated land lies in the fact that such proposals must include adequate safeguards against the possibility of further sudden sinking of the littoral area at some future date. There is now ample evidence that this type of movement has been of fairly regular occurrence in the past.

THE FUTURE

There is no doubt that the seismic disturbances have focused attention on weaknesses in the state of agriculture in this part of Chile. In a like

manner it has brought more widespread realisation of the need to work consistently to maintain and spread the benefits of a desirable standard of living. The earthquake of the Day of Arturo Prat—the hero who, be it remembered, once before served his country well at a crucial time—well and truly shook up a region in Chile where production has long been hampered by an uneasy compromise which seeks to adapt the existing agrarian system to meet the urgent demands of the modern national economy. In this respect, Chile needs to use its soil resources with much greater effectiveness. This will be an adventure requiring much more than technical assistance from agronomists and soil scientists. Perhaps, dating from the "Year of the Big Earthquake", with the construction of the new country schools, the development of more closely integrated schemes of adult education, with closer attention to rural health and nutrition and more liberal financial credits and financing for landless persons with the will to work, with better facilities for storing and transporting produce and better guidance for small farm settlements that are actually in train or under consideration, there may emerge a new rural environment necessary for, and capable of, meeting the future needs of the rapidly multiplying Chilean population.

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Problems of Development in Fiji

R. F. WATTERS

THE Fijian problem is an intricate complex of several constituent elements: the precarious foundations of the economy, the cleavage of culture between Indians and Fijians, the rapid increase in the Indian population, the land tenure question, the low productivity and stagnation of the Fijian community, and the rising strength of Indian nationalism. The Fijian Government in 1958 appointed a commission to investigate these problems and to put forward a plan for economic development. This paper attempts to analyse the main elements of the "Fiji Problem", to consider how they are interpreted by Fijians and Indians, to discuss some of the more significant recommendations of the "Burns' Commission,"[1] and to elaborate in this context certain suggestions made by the author prior to the publication of the Commission's report.[2] The failure of the Fijian leaders to accept many of the recommendations of the Burns' Report also prompts this further survey.

ECONOMIC INSECURITY

Most immediate in its need for remedy is the economic dimension of the Fiji problem, which underscores almost every other element of the problem. Along with other South Pacific Territories, Fiji is faced today with the need to accelerate the pace of economic development even if it is to maintain current standards of living. The relationship between population trends and economic development is most disturbing. The average annual rate of population growth between 1946 and 1956 reached the high figure of 2.91 per cent, while per capita income appears to have remained static. In the period 1936-58 population has increased by 80 per cent, while the volume of agricultural production has remained on the whole about the same with the exception of a 40

[1] Hereafter this will be referred to as the Burns' Report. Inevitably some of the ground that this paper covers has been dealt with already in the Burns' Report and the Spate Report (1959). However, wherever possible new material has been presented. The author gratefully acknowledges support provided by the University of New Zealand Carnegie Social Science Research Committee, which enabled field work in the Group in 1958 and 1959. A further visit was made in 1961.

[2] See *Evening Post*, Wellington, 14 November 1959; *The Guardian*, 27 November 1959.

R. F. Watters is Senior Lecturer in Geography at Victoria University of Wellington.

per cent increase in sugar cane production. Over the same period, imports of agricultural commodities that could have been produced in Fiji have increased 19 times. Only a sixfold increase in the prices of agricultural exports over these years has enabled the average annual income in Fiji to maintain itself at the modest level of about £(F)70 per head. At the same time, accelerated social change since the Second World War has led to a steady expansion in the aspirations and wants of both the Fijian and Indian communities—an expansion that has not been matched by an advance in their capacity to satisfy these needs. In short, the Fijian economy seems to be caught, at least temporarily, in a vicious circle in which several components interact in a relatively stable fashion. Thus small increases in national income over the last decade or two have merely generated a relatively greater increase in population, in the main by lowering the death rate. Since per capita income has remained low, the ability to save and the level of technical ability and credit facilities have also remained low. These factors have themselves acted as a check on the rate of innovation[3] which in turn retards the spread of productive entrepreneurial abilities. Thus economic growth in Fiji has not on the whole been an autonomous process. The injection of capital into the economy from outside and the rise of the sugar industry have induced irregular growth, but some of the variables later return to a relatively stable state and the economy as a whole does not steadily move forward to new positions. Thus institutionalised behaviour has been modified by only slight degrees. This view cannot be demonstrated statistically over a broad span of time, as statistics of the values of significant variables only date back to 1950; it is, however, supported by the results of an analysis of the structure of the Fijian economy.

ECONOMIC UNDERDEVELOPMENT

In general the Fijian economy is characterised by a low level of per capita income, and manifests many of the economic, technological, demographic, cultural and political features[4] that are commonly attributed to underdeveloped economies. It is useful to examine Fiji's position a little more closely in this very broad category.

Between 1950 and 1957 the Fijian national income increased by roughly 3 per cent a year. However, population also increased at an estimated average of 3.22 per cent a year, so that the average per capita

[3] Over recent years the rate of innovation seems to have increased, with substantial progress being made in agricultural mechanisation in the sugar sector and also improvements in the public sector (e.g., long-term economic gains accruing from the Department of Works' roading programmes, etc.). An accelerated rate of innovation stimulated by the public sector, coupled with a fuller utilisation of existing land resources offers an important means of escape from the present position.

[4] Many authorities list these features: e.g., Leibenstein (1957): 40-1.

income, calculated at constant 1953 prices, remained stationary, varying between £66.60 in 1950 to £72.25 in 1953 and £67.55 in 1957. The Burns' Report assumes that national income will probably continue to grow at 3 per cent per year over the next decade, an assumption that means that with population growth at over 4 per cent in this period, the average income per head will fall slightly.

In several characteristics, Fiji has certain advantages over other underdeveloped countries. Poor, underdeveloped countries usually have 60 to 80 per cent of their population in agriculture; in Fiji only 58 per cent of the occupied population is thus engaged. An analysis of the economic sectors of countries over a long period of pronounced economic growth reveals substantial structural change: the proportion of the population employed in agriculture declines sharply by 50 or 60 per cent (say, from 70 to 15 per cent), manufacturing grows from about 5 per cent to perhaps 30 per cent, while the tertiary sector expands from 25 per cent or less to 50 per cent or more. In Fiji from 1946 to 1956 the agricultural sector declined by 5.62 per cent while the tertiary sector increased by 8 per cent to reach the figure of 34 per cent. Manufacturing, however, did *not* increase as expected; in fact, it declined from 9.47 per cent in 1946 to 7.01 in 1956. This decline in the proportion employed in manufacturing is a development of the most serious kind, especially in view of the fact that the increase in productivity in the agricultural sector has been practically non-existent apart from sugar. Viewed against these facts, the great expansion in tertiary services can be seen to be uneconomic and unsound—in part a spurious process that has accompanied the rise in export prices which has led many people to believe falsely that per capita wealth was in fact increasing. In recent years there has been a flight of foreign capital from Fiji which reflects the relative decline of manufacturing and growing awareness on the part of business interests of racial antagonism and labour trouble.[5]

ECONOMIC PLANNING

In planning development for the next decade or two it is more practicable to accept the relative place of agriculture and industry[6] in the

[5] From 1953 to 1957, foreign investment declined by £(F.)3,397,000.

[6] The prospects for industrialisation are poor in a country with such a poor resource base, undeveloped power sources and suffering from a shortage of capital, while the most promising development in industry—the processing of local raw materials for local consumption can never reach sizeable dimensions in view of the small size of the local market (see Belshaw [1960]: 135). Expansion of the largest industries, sugar processing and copra crushing, seems likely to remain limited in view of Fiji's limited quota in world markets. Every effort should be made, however, to stimulate the process of industrialisation by attempting to develop tourism, fish canning, timber resources and exploit hydro power.

internal structure of the economy, while attempting to improve the productivity of each. Indeed this writer maintains that substantial progress could be made in agriculture if legislative action were taken to modify or remove Fijian cultural disincentives and to redesign an institutional structure suited to a mid-twentieth century, multi-racial, Fiji. At the same time, more support should be given to independent farmers on the one hand and to the co-operative movement on the other. Moreover, a considerable reduction in the expenditure of overseas assets could be achieved by producing locally many of the foodstuffs now imported (e.g., rice, meat, dairy products, potatoes).

TABLE 1

National Product per capita, Share of Domestic Product Originating in Agriculture, and Proportion of Agricultural and Rural Population; Fiji and Selected Countries, 1952-54.

	Per capita net national product, factor cost (U.S. $)	Agric. share of domestic product %	Male workers in agriculture %	Rural population %	Disparity factor‡
New Zealand	1,000	24	22	39	1.1
Puerto Rico	430	20	47	60	0.3
Panama	250	34	58	64	0.4
Portugal	200	30	52	69	0.4
Fiji	187	55*	53†	56†	0.7
Jamaica	170	46	70	78	0.3
Philippines	150	43	71	76	0.3
Honduras	150	50	83	69	0.2
Ceylon	110	53	51	85	1.1

Notes: *1953. †1956.

‡The disparity factor indicates the ratio between per capita income generated in agriculture to per capita income generated in other industries. It shows that within the Fijian economy, agriculture is relatively productive compared with industry. By world standards however, Fijian agriculture is not particularly productive: see table 2.

Source: F.A.O. (1959): 193; Burns' Report.

CAPITAL ACCUMULATION

A basic handicap to economic growth in underdeveloped economies is the slow rate of capital accumulation. The problem usually involves forcing the investment rate from the characteristic figure of about 5 per cent of the national income up to a figure of about 15 per cent. Significantly, total investment has been unusually high for an underdeveloped economy, representing about 20 per cent of national income in 1957. In spite of such a high rate of capital formation, however, a

rate of income growth of only 3 per cent a year has been achieved.[7] This moderate rate of growth in spite of such a high input of capital can only be interpreted in two ways: firstly, the allocation of resources has been unwise, with too much capital being invested in unproductive fields, and secondly, the unfavourable institutional structure and unrationalised economic system have limited the effectiveness of this high rate of investment. On this first point, the Burns' Commission is clearly right in criticising the composition of Government investments and recommending among other things a decrease of expenditure on building and construction which apparently represented over one-third of total fixed capital formation in 1957.[8]

TABLE 2

Yields per Acre, Fiji and Selected Countries

	Fijian Plantation Sector	Fijian Traditional Sector		
Country	Sugar 1954-55	Copra and Coconut oil Cwts. per acre	Bananas Tons c.1955-57	Rice 100 Kgms. per hectare 1955
Fiji	2.4*	4.4†	1.6‡	15.7§
Jamaica	2.7			
Cuba	2.0			
Puerto Rico	2.7		2.4	
Australia	3.5		3.3	
Western Samoa		7‖	6	
Netherlands New Guinea		5.6		
Philippines	2.4¶		.66	
Malaya		4.2	5.4	
Brazil			11.5	
French Equatorial Africa			4.7	
Japan				48.1
China				54.7**
India	0.8***		4.7	12.6
British Solomon Islands		9.6		

Notes:

* In 1959-60 the Fijian figure was 3.2.
† Average 1956-58.
‡ Average 1955-58.
§ In 1953.
‖ Average 1956-59.
¶ Including *gur* low grade sugar.
** In 1954.
*** Including *gur* converted to raw sugar.

Sources: Commonwealth Economic Committee, *Fruit*, London, 1960; *Vegetable Oils and Oilseeds*, London, 1960; and *Plantation Crops*, London, 1956; Higgins (1959): 10; Burns' Report; *Annual Reports* of Various countries.

[7] Statistics are not available for a sufficiently long period of time to calculate incremental capital output ratios that would be reliable indicators of growth.

[8] Examination of various heads of expenditure in Government Current and Capital Expenditure also reveals that in the last decade the Department of Agriculture has not received more than the pitiful proportion of 3 per cent of the total moneys spent. While the high expenditures on Public Works (30.4 per cent in 1958) and Education (12.4) will in the long run assist the process of economic development, the total of only 7.1 per cent spent on all "Economic services" (Agriculture, Forestry and "Other") is woefully inadequate.

This paper will show, however, that the other explanation—the unfavourable economic environment of Fiji—is at least as significant in hindering the rate of economic growth. Serious deficiencies characterise the European and Indian sectors of the economy, but it is obvious that the greatest effort in the future will have to be made by the Fijian people. What is needed now is a "big push" to overcome such income-depressing forces as the surplus of labour and cultural barriers which inhibit sustained growth.

POPULATION GROWTH

Population trends not only play a major part in contributing to the economic insecurity of the Colony, but also serve to exacerbate the problem in the field of race relations. Out of an estimated total population of 400,000 at the end of 1960 the native Fijian population comprised 41 per cent of the total and was increasing rapidly. The Indian population, however, first exceeded that of the Fijians in 1944, and since then the gap has been steadily widening. At the end of 1960 Indians represented nearly 49 per cent of the total population.[9] Indian birth rates are higher than the Fijian and death rates lower; Indian women marry younger, have their first children on the average three years earlier than Fijian women, and a higher percentage of female children or future mothers are born to Indian women. Fewer Indian women are childless, and a larger number of children are born to Indian mothers in each five-year age group. It is an augury of the future that over half of the Indian population is under 15 years of age with nearly half of the women in the child bearing ages between 15 and 45. On present trends it seems likely that the total population of the group will nearly double in the next twenty years, by which time the Indian population will exceed the Fijian by over 20 per cent.

The facts of population growth are disquieting on an objective view when considered in relation to racial antagonism. But even more distressing is the way these facts are interpreted by the two main communities. The submissions of both the Fijian Council of Chiefs and the representatives of the Indian people[10] provide an illuminating commentary on the racial question in their sharply contrasting assessments and recommendations. The Fijians express grave concern at the rapid increase of population in the Colony, claiming that

> ". . . there is a conspicuous lack of any organised endeavour by the Indian leaders and people generally to encourage among themselves methods of birth control or family planning; and, in the second place, there is the evident indifference among Indians generally to this most serious problem."

[9] The balance of the total population is made up by Europeans, part-Europeans, Rotumans and other Pacific Islanders, and Chinese.

[10] Council of Chiefs (1959); Indian Community (1959).

The view is expressed that it is "a clear moral duty of those who contribute most to this growth to display a sense of responsibility in controlling their birth rate". However, in advocating a birth control policy the Council of Chiefs is wise in not recommending its application to only one section of the population.

On the whole, the Indian representatives deny the existence of a "population problem", for they believe that the Colony is "much too underdeveloped and underpopulated", and that it requires many more people to develop it for the material and moral welfare of all settlers. On the socio-political ramifications of population growth the representatives declare themselves in unequivocal terms:

> "What in fact the community has taken an exception to is the political implication that the Indian people would dominate by sheer predominance of their numbers, and thus jeopardise the interest of other races in the Colony if the increase in numbers is not curbed."[11]

In evaluating the two contrasting viewpoints it is important to distinguish between the social and political implications of population growth on the one hand and the economic implications on the other. Unless the current racial antagonism can be greatly ameliorated it is clearly undesirable on grounds of expediency that one community should increase its numerical ascendancy over another; accordingly birth control should be actively promoted as an attempted check to the rate of growth.

The economic implications are, however, equally important. By all objective tests, Fiji is not overpopulated. The overall density of population in 1961 is only 57 people to the square mile. However, man-land ratios treated in isolation are of little value, for it is in the economy, rather than directly on the land, that population pressure is mainly felt. Demographers commonly assert that in a country with a predominantly agricultural population density should not exceed one person to two acres of cultivated land. On this basis the low overall density is converted to the remarkably high figure of 1.01 persons per acre of cultivated land, much of which can only be used occasionally under the system of shifting cultivation. In other words, population pressure can be said to exist *only* if we regard the present deplorably low area of cultivated land—8.4 per cent of the total area—as representing the maximum that can be utilised. However, the soil survey found that 29.87 of the total land area (1,356,471 acres) is suited to permanent agriculture with little improvement necessary, while a further 31.93 per cent (1,449,894 acres) could be utilised permanently after major improvements are accomplished. While opinions have been manifold about the extent and fertility of utilisable land,[12] these conclusions of a care-

[11] Indian Community (1959): para. 153.
[12] See Clay (1955): 3; Spate (1959): 1, 20; Ward (1959): 322, 341.

ful scientific survey cannot be gainsaid; while other resources are in short supply, Fiji has one great asset for expanding production. Why is the proportion of cultivated land so low? Partial explanations result from the shortage of capital and the lack of advanced technology, feeder roads, etc., but the most effective obstacles to land development have been the preservation of traditional attitudes toward the land, coupled with the system of land tenure and the Reserves policy.

THE LAND QUESTION

Some of the implications of population pressure can be appreciated when one learns that four-fifths of the land is owned by two-fifths of the population. Absolute right of ownership were guaranteed to the Fijians by Britain in the Deed of Cession of 1874, five years before the Government began the introduction of the first Indians as indentured labour for the sugar plantations. Of the 3,776,000 acres that they own, only 379,600 (10 per cent) were cultivated by Fijians in 1957, and much of this can only be used under current techniques in a system of shifting cultivation, in which land is cultivated on a rough average for only one year in seven. In contrast, Indians own only 75,830 acres of freehold and lease a further 350,000 acres under various forms of tenure. Of this total 172,625 acres are cropped (41 per cent) and an unknown acreage used for grazing.[13] Thus the more numerous Indian population have access to a much smaller area of land, and their demand for land is accordingly much greater.

The question of land ownership has long been the subject of bitter dispute.[14] At its 1959 meeting the Council of Chiefs was greatly concerned lest the promises embodied in the Deed of Cession should not be honoured in the future. The Chiefs absolved themselves of any responsibility for changing conditions and declared that "The Fijians' rights and interests . . . which have always been acknowledged to be paramount must continue to remain so".

The Indian community on their side recall the British promise that their rights in the Colony would be in no way inferior to those of any other race. However, the Indians own only "a mere . . . fraction of the land" and commonly suffer from short-term leases, experience difficulty in securing or renewing them and receive no compensation when their land is taken over for Reserve.

The question of land holding is even more contentious than that of land ownership ,for the Fijians who own nearly all of the land contribute little to the main source of income,[15] while the more numerous Indian

[13] Figures from draft of Soil Survey Report of Fiji by A.C.S. Wright and I. T. Twyford and Burns' Report, paras. 85-87.

[14] See Mander (1954): 402-409, and Pim (1946): 77-87.

[15] In terms of the cash value of all export crops, the Fijians earned £2,088,415 for the Colony in 1957 compared with the Indian figure of £7,958,844. Wright and Twyford (unpublished manuscript).

population, living mainly in the dry zone, is increasingly being evicted or denied access to good sugar-producing land. In the sugar-producing dry zone of the two main islands (Viti Levu and Vanua Levu) the land problem is most sharply focused, for here Indians hold much of the land acquired earlier on lease from Fijian villages. In recent years the Fijians have become steadily more cash-conscious and as they emerge from traditional subsistence agriculture are growing more crops for the market. In order that they would actually hold enough of the land that they own to compete effectively with the Indians and so contribute to the developing economy, a Reserves policy was inaugurated in 1940. Under this policy certain lands were to be declared Native Reserves and were to be exempted from leasing again after current terms had expired. In their submissions to the Burns' Commission in 1959 the Council of Chiefs expressed their "fervent prayer" that nothing would happen now or in the future which would in any way impair their faith and trust in British rule.

The Indian representatives on their part, complain of Indians being dispossessed of their land due to reservation, only to see the land go out of cultivation. The representatives, however, apparently realise the futility of trying to oppose the basic principles of the Reserves policy, and instead press for leases to individual Fijians under secure conditions of tenure, and also recommend that the Native Land Trust Board exclude land from the Reserves with the consent of the native owners whenever an application for land is made by individual Fijians or by persons of other races.

Whatever the wisdom of the Reserves policy may be, Spate has noted that there is some risk that Reserves might become merely the "static defences of an inert garrison". Failure to use land formerly cultivated by Indians inevitably leads to dispute. Indeed it may reasonably be thought that the Reserves policy is an "over-protective device" that is not in the long-term interests[16] of the Fijians themselves as it effectively insulates them from Indian competition on the land.

Although the Burns' Commission rightly upholds the Deed of Cession which guarantees Fijian land ownership, it expresses grave dissatisfaction about conditions of tenure and utilisation. In particular, the Commission feels that "much of the anxiety and uncertainty" about land and most of the "sense of frustration" among farmers is a consequence of the Reserves policy. More deplorable is the fact that after twenty years the demarcation of Reserves is still far from finished—a delay that has resulted in the renewal of many leases on a yearly basis and the consequent depletion of the soil by robber farming. At the same time inadequate attention has been given to the parallel aim of making land avail-

[16] Some form of reservation for a short, limited period, would be very valuable if every effort were made to increase Fijian productivity to a comparable level with that of the Indians.

able for leasing outside the Reserves "to people of any race" so that the land hunger of the growing Indian population has been accentuated. Indeed land shortage is being expressed in rural underemployment. Thus the 1956 Census reveals that there was a total of 16,883 Indians connected with cane farming—some 6,000 in excess of actual production requirements. This immobilisation of labour may seem to be unusual in a country in which only 10 per cent of the land is utilised—a fact that eloquently demonstrates the obstacles to development that arise from the Colony's institutional structure.

As more and more of the fertile plains of the dry zone are cultivated by Fijians in the coming years their contribution to sugar production will be keenly watched. In contrast to the position of earlier years, most Fijian land in the dry zone (though not elsewhere) is now worked, for the Fijian chiefs fear for the preservation of their "paramount rights and interests" if land is allowed to lie idle. However, Fijian cane production is much lower than that of the Indians. In 1957, sugar provided 13.69 per cent of the net domestic product, and of the the total production, Indians contributed over 95 per cent and Fijians only 3.25 per cent. Between 1953 and 1957, Fijian cane yields were consistently below Indian yields, averaging 19.3 and 20.8 tons per acre respectively for Fijian and Indian tenants of the Colonial Sugar Refining Company, and 15.5 and 19.4 among the more numerous contractors. Only Fijian independent farmers, who mostly live outside the village, compared favourably with their Indian counterparts.

An overall assessment of productivity can be gauged by comparing the contributions of each community to the net domestic product of the Colony. While data is lacking on some aspects, it is clear that the Fijians contribute not more than between 30 to 40 per cent of the total agricultural produce compared to the Indian figure of over 40 per cent, the remainder being produced mainly by Europeans. In the nonagricultural sectors (50 per cent of the net domestic product) the precise contributions of the two ethnic groups cannot be measured, but it seems that Indian production of goods and services is only rivalled by the European community, with the Fijian share being quite negligible. In terms of the whole net domestic product, the total contribution of the Indian community in all sectors is more than twice as large as that of the Fijian community.

LOW FIJIAN PRODUCTIVITY

The causes for low Fijian production stem from the persistence of many traditional (or quasi-traditional) patterns of culture to the present day. Before we examine the reasons for the slow rate of social change, it is necessary to consider the character of these traditional patterns of culture. These patterns evolved in an isolated island world to suit the subsistence needs of a people who were organised socially

into patrilineal descent groups with complex social relationships and kinship patterns and a system of political authority that was heirarchical and authoritarian in nature. This culture was admirably adapted to life in an oceanic, pre-Western environment; inevitably it was not adequate to face the problems of existence in a twentieth century, market-dominated world. An analysis of Fijian culture reveals the existence of many elements that demonstrate this inadequacy.

The greatest deficiency of traditional patterns of culture for modern economic development lies in the fact that, like many non-Western cultures, they evolved on the basis of a non-cash economy. While economic pursuits were just as basic as in a cash economy, the food quest assumed much less importance in everyday life due to the ease with which subsistence needs could be satisfied. In the absence of cash and commerce, the productive process was not market-oriented and so was never rationalised, as in the West, in order to increase output and maximise individual profits. Since economic activities were "submerged in social relationships", exchange took the form of reciprocity, not commerce, and accordingly a much smaller disposable surplus was produced. As the institutional framework expressed the structural characteristics of such a society and the ways in which it functioned, it not unnaturally failed to provide a suitable vehicle for economic development in Western terms. The systems of land tenure and utilisation reflected the basic principles of social structure and political authority and were characteristically those of a society with a local community emphasis. The solidarity of the forms of social organisation is expressed in the characteristic values that motivated social action.[17] Moreover, the maintenance or improvement of status ordained the ostentatious display and rapid consumption of goods, inhibiting the accumulation of wealth. While problems of real choice existed no less than in the cash economy, status and custom decided the way in which choice should be made. This tightly organised society was particularly cohesive, and with the coming of the West "the high degree of rigidity and formalism" that Geddes sees in the social system provided obstacles to social change.

The system of social structure was not attuned to the needs of the twentieth century. Western society was not surprisingly viewed "as an anarchist state of rabid individualism". Traditional forms of co-operative work often meant that over a certain period a person would obtain greater value in the form of goods or services from his kin than he would contribute in return. Individuals had little incentive to work harder than their fellows, for the only reward was the right to reciprocal service or an equal share in the produce of the group. Although in many situations today depersonalised economic relations involving money

[17] The kinship classification "set type attitudes and behaviours patterns" and largely determined "the ordering of interpersonal relations within the kinship setting". Nayacakalou (1955): 44-5 and (1957): 44-59.

payments do exist alongside traditional kin-based associations, it is clear that traditional principles often affect the efficiency of work done on a contractual basis. The calls that are made on the hard-won savings of many independent farmers are well known, and, although these are being increasingly resisted, the slaughter of working bullocks (the main capital equipment of cane farmers) is by no means uncommon to provide kinsfolk with meat for a feast.

The time spent in celebrating weddings, births and funerals has frequently been remarked upon by agriculturalists and economists. Another serious obstacle to economic development is the absence of specialisation of labour in village life. Of various tasks that are still generally done by group work, that of housebuilding is particularly time consuming and expensive. In Nalotawa, Mba province, the building of the chief's house in 1959 occupied all the men in the village for five weeks (i.e., about 500 man-days). These examples of traditional activities show that some provide serious disincentives to economic effort, while at the same time their persistence hinders to some extent the introduction of new incentives, economic and non-social in type.

SLOW RATE OF FIJIAN SOCIAL CHANGE

Numerous observers have underlined the urgent need to accelerate the pace of social change in the Fijian way of life. In 1947 the famous Fijian leader, the late Ratu Sir Lala Sukuna, admitted "certain" weaknesses in the Fijian social system and declared that it would take years for the Fijians to catch up with the Indian standard of agriculture:

> "If the paramountcy of Fijian interests—which this Council has subscribed to —means anything at all, the Fijians have the right to demand time in which to change their way of life."[18]

Thirteen years after these words were uttered the situation is virtually the same, but with population trends making it even clearer that the Fijians have even less time in which to change their way of life.

In recent years, Sir Geoffrey Clay, Carleen O'Laughlin and R. S. McDougall have all found that some of the obligations and sanctions of the communal way of life were out-of-date in a developing community in the second half of the twentieth century. In his report of 1959 Professor Spate has presented an even more impressive case for the speeding up of the rate of change, showing that "a people cannot contract out of the century it lives in". Finally in 1960 the Burns' Report speaks in unequivocal terms:

> "We . . . feel that impact of Western civilisation has so far failed to induce a new outlook towards efficiency and productivity. Furthermore, traditional attitudes and behaviour in the rural areas, particularly among the leaders of the

[18] *Pacifc Islands Monthly,* December 1947.

people, are still a major obstacle in the way of technological change and there is a reluctance, if not a failure to grasp the present day economic situation."[19]

What are the reasons for the persistence of so many of the traditional patterns of culture that hinder economic advance in spite of the almost single-minded criticism of so many competent observers? In the first place, it is clear that the introduction of a money economy led to no rapid transformation of society partly because it was an indigenous crop—the coconut palm—that acquired a monetary value. Commercial production up to the present day has required little effort, merely involving an extension of traditional practices. As one Fijian aptly remarked to the Burns' Commission, "My coconuts say to me 'If you take care of us for four years we will take care of you for four generations'." Moreover, most exotic crops such as the banana have been so completely "contextualised" in their adoption into the Fijian agricultural system that no great disturbance or reorientation of agricultural practice have resulted. Indeed, it appears that an agricultural revolution will not be set in train in the Fijian countryside until there is a sustained demand for crops that require a more rigorous application of labour throughout the year, long term and more individualistic attitudes towards the land, a sharper perception of economic advantage, and a depersonalisation of economic activities that will free them from their socio-cultural trammels. To some extent these requirements are being partly met in a few villages engaged in sugar production (e.g., Nawaka near Nandi), but no widespread developments suggest that a general agricultural revolution is yet in sight.

A further explanation for the resistance to change arises from the way in which Fijian culture has reacted to the challenge of Western values and a cash economy by perpetuating some of its focal elements. This type of reaction is by no means confined only to Fiji. Thus strong group sentiments, based on the exclusiveness of local groups, have been staunchly upheld, at least until recently. Cherished ceremonial has retained much of its old vitality in some parts of the Group. Carleen O'Laughlin has noted that the development of wage-earning and cash-cropping and the concomitant tendencies toward individualism have been accompanied by a compensating "tightening of the formal code" which demands the individual's recognition of the community's primary option on his labour. The survival of *kerikeri* (the custom of asking a relative for some article that is needed) and various traditional obligations, mostly connected with the persistent social structure, may also be seen as evidence for this "perpetuation movement",[20] which has been the Fijian reaction to the challenge of Western values. The reintegration of Fijian society following the impact of the West in the nineteenth century was made possible by the continuance of the system of

[19] Burns' Report, para. 210. See also Stace (1954).
[20] Freed (1957): 55-67.

land tenure on a communal, clan basis. The clarification and legalisation of the traditional system provided a stable foundation that permitted the survival of many elements of the traditional way of life.

It is commonly recognised that social structure forms one of the most persistent group of elements in any culture in the course of change. Geddes has pointed out that a "unity of structural principle was a source of strength to the traditional society"—a unity and logical consistency that derived from the over-riding importance of the kinship principle in the whole system.[21] Moveover, through the functioning of the kinship principle, the same sets of people appeared constantly in the main fields of social activity—in economic, political, religious, ceremonial and recreational activities. Thus not only did mutually related principles reinforce one another in the system and give it a great deal of its coherence and solidarity, but the wide variety of functions that the various groupings (patrilineage, clan and phratry) regularly fulfilled gave the whole system much of its strength in its resistance to change.

Arising largely from the social structure and the role of individuals within it are those characteric Fijian "habits of mind" that Spate regards as important in explaining the slow rate of social change. These, he feels, are "too set for the people to come into the modern world quickly; moreover they have attempted to do so on their own terms." The unbending attitude of the Fijian people and especially of the chiefs (who have a vested interest in the maintenance of the communal system) has also hindered change—a reactionary attitude that is clearly expressed in the 1959 submissions of the Council of Chiefs to the Burns' Commission:

"Much has been made in certain quarters in recent years that the very nature of our communal way of life on which the village is based provides a disincentive to production above the subsistence economy level. The Council strongly disagrees with this view; *it has constantly given this criticism much thought and has not found any ground for its claim to validity.*"[22]

[21] In Fiji, kinsfolk were reckoned by the classificatory method, which involved an extension of the vertical and lateral ties found in the elementary family to embrace all members of the wider groups. Thus the strength of relationships determined by sex also operated in the lineage, those by age applied to other generations, and the unity of siblings extended to more distant kinsfolk. With patrilineal descent, patrilocal residence and common ownership of land in the patrilineal line, each agnatic group is a persistent and well-defined group.

The widest patrilineal descent group or *yavusa* is more commonly a "phratry" or grouping of *mataqali* or clans, each of which has a unitary descent structure. Beneath the exogamous *mataqali* which are the land owning units, are the *itokatoka,* smaller groups which may be termed patrilineages since the genealogical relationship of its members is known.

See Nayacakalou (1957): 50-1; Geddes (1959): 205-7.

[22] Council of Chiefs (1959): Para. 33. The italics are mine. The above analysis is another attempt to show the validity of much of this criticism, which Sukuna at least has admitted (see p. 166 above).

It seems then that the persistence of traditional attitudes and values, the strength of social structure, and the high degree of integration existing between patterns of culture have allowed many of them to survive the buffets of the modern world, even if in modified form. But without doubt the perpetuation movement could not possibly have succeeded without the powerful support and protection of the Fijian Administration—that autonomous administrative machine, divorced from the central government, that has jurisdiction over all Fijians in the Colony. This elaborate superstructure, erected in the interests of Fijians, performed a vital task in protecting them from Indian economic competition at an earlier period when it was sorely needed, and its various departments have aided and guided them in some aspects of economic advancement. But to many friends and well-wishers of the Fijian people, it seems that too much spoon-feeding leads to a dangerous dependence on the Administration—a dependence that is incompatible with the rising demands for a greater share of self government.

A bulwark of the communal way of life has also been provided by the Fijian Affairs Regulations, a simple code of civil and criminal law which seeks to secure "the continuance of the Fijian communual system and the customs and observances traditionally associated with that system". Spate has criticised the Fijian Administration for its uncritical attitude toward the requirements of development, "arrogating the right to be the *sole* judge in one's own case"; such a policy, he found, is "intolerable in the modern world". Recently, it has been noted that the Administration provides an obstacle to political advancement:

> ". . . because it represents an attempt to treat native administration as a part of government quite distinct from the general government of a colony in which the natives are already a minority. It also, even at the time it was set up, represented a step backwards to a conception of native administration abandoned in most other colonies."[23]

It is claimed by a defender of the system that it "has for seventy-five years proved to be practical and adaptable in the changing needs of world conditions", yet it has assimilated little beyond Western techniques of administration. Indeed the person who has made this amazing claim has elsewhere admitted unconcernedly that the Administration leaves "technical services and assistance to be provided by arrangement with the Central Government".[24]

The Burns' Commission regards the Fijian Administration as a completely exclusive and increasingly entrenched autonomous body that is divorced from the Central Government; moreover, it "tends to isolate the Fijians from all other communities", and continues "to foster an outdated communal system against the wishes of a large number of

[23] West (1960): 23-37.
[24] Roth (1953): 134, 160. See also Roth (1951).

people who desire a much greater degree of freedom". Evidence of this was provided in the large number of cases tried for failure to comply with the regulations for communal work—a number that exceeded 3,000 in 1958. Thus the administrative system appears to play a significant role in the Fiji Problem by perpetuating patterns of culture that function as disincentives to an increase in productivity.

CULTURAL CLEAVAGE

The contrasts in productivity between the two main communities point up the contrasts between their respective cultures. We must now consider Indian culture, which in comparison with the Fijian way of life is characterised by very different values and interests and by a highly competitive market spirit. The Indians are not so closely tied to the culture that nurtured them, for on leaving India and after mingling freely with one another on board ship on the voyage out, many caste divisions were seriously weakened. Moreover, they came to the Group as individuals, not as groups of kinsmen or even fellow villagers. A dispersed pattern of settlement naturally occurred as blocks of land were leased according to individual choice, and the requirements of working dictated by the cane crop further weaned the settlers from the village-based, grain-growing life that they were accustomed to in India. In short, their culture was not adjusted to the Fijian environment, and although much of their rich cultural heritage has persisted without obvious weakening, different conditions in the new land caused many elements of their already uprooted culture to change. The result has been to make the Indians even more highly individualised people than they apparently were before arrival. Moreover, since the law prevented the Indian immigrants from owning land, the only economic incentives open to them were those of a money kind. In the early years of settlement low cane prices stimulated the Indian farmers to the utmost to earn enough to purchase such basic necessities as food and clothing. In view of these factors, it is not surprising that today a highly cash-conscious, competitive spirit characterises the Indian of Fiji, whether he is a cane grower, taxi driver, tailor or shopkeeper.

The greatest issue of all, however, would seem to be this—will originally separate cultures remain separate, or will the gulf between them be bridged? The magnitude of the gulf will be apparent from the quotations given above from portions of the respective submissions to the Burns' Commission. On the surface, however, the visitor to Fiji may well be impressed at the friendly relations that appear to exist between the two peoples. In the streets, the market place and on the buses the two races mix in friendly relationship. There is some cultural borrowing too from one group to another with respect to food, language and house types. All this is encouraging, but those who have lived with Fijians and Indians know that beneath the veneer there exists at best

an uneasy tolerance, a grave suspicion and mistrust between the two peoples.

In 1945 Geddes diagnosed attitudinal differences as basic to this aspect of the Fiji Problem:

> "There has never been any mixture or community of interest between Fijian and Indian. Instead their attitude has been one of mutual disrespect, the Indian scorning the Fijian as lacking in intellectual quality and the Fijian despising the Indian for his physical inferiority. It can therefore be regarded as almost certain that in the years to come, disharmony between these two groups will greatly disturb the Fijian scene."

Geddes observes that there is a feeling among some Fijians that all other races in Fiji are really imposters—"strangers who have come to steal the natives' birthright". A few years later, W. E. H. Stanner noted the "harsh imperialism" of Indian attitudes to the Fijian, declaring that the most inveterate problem of Fiji "lies in the economics of Indian life in combination with a conservative culture, a violent demographic movement, and a rankling sense of political and social injustice".[25] The author found in 1958 and 1959 frequent expressions of an equally harsh imperialism of Fijians toward Indians. The view of one of his Fijian friends was typical: "We like Indians only in our talk and not in our hearts".

The only serious study that has been made of race relationships reveals a serious conflict between differing ideals as well as differing interests.[26] In classifying Fijian attitudes to Indians according to a five-point scale, A. C. Cato found that 63 per cent of the responses revealed an attitude of complete intolerance of the presence of Indians in Fiji, while a further 25 per cent expressed willingness for them to remain only under conditions favourable to the Fijians. On the subject of self-government in co-operation with the Indians a great majority expressed complete opposition, while replies were most unfavourable on the questions of a common educational system to develop inter-racial friendship and the possibility of Fijian-Indian business partnerships.

Cato's evidence of Indian attitudes towards Fijians is less systematic and objective; these he considers express the Indian's sense of superiority over the Fijian and his culture. While the Indian is often fairly tolerant toward the Fijian, it is sometimes a contemptuous form of tolerance. While chafing at his economic and political inequality he

> ". . . has a confidence born of increasing numbers, of industrial, commercial and agricultural success, of a conviction that he is indispensable to Fiji's future, and finally, of a twofold assurance, first in the growing international importance of India, his country of origin . . . and, secondly, in his British citizenship. He uses whichever of these two suits his purposes best at the moment."[27]

[25] Stanner (1953): 258.
[26] Cato (1955): 14-34.
[27] Cato (1955): 21.

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Significantly too, intermarriage between Fijians and Indians is negligible, and the solidarity and identity of each people show few signs of weakening. In contrast to the growing assurance of the Indian community, the attitude of the Fijians, which appears to have been moderately tolerant a generation ago, shows no signs of any tendency to compromise and indeed is probably hardening.

THE WAY FORWARD

This paper has shown that few bases exist for future unity in a harmonious multi-racial society. The economic activities of Indians and Fijians are different and are carried out separately, their cultural patterns are quite discrete, and the respective ideals and values that spring from each culture reinforce the identity of each by inhibiting intermarriage and a merging of interests. Many of the current inequalities and much of the institutional structure spring from these basic differences and further accentuate the pluralness of society. While Westernisation and urbanisation provide some sort of a social consensus between sections of the two peoples, the problem will become worse unless the Government takes early action to abolish institutions that reinforce division and establish new ones that will canalise the activities and interests of both peoples in the same direction.[28] These must be neither Fijian nor Indian—nor indeed precisely European—but must be new hybrids, especially suited to the needs of a whole Fijian people. In the first place the present policy of separate education for each community[29] must be drastically altered to a policy of multi-racial education, which would facilitate a greater interpenetration of culture patterns and a broader sharing of valued activities.

Secondly, the Fijian Administration must be gradually abolished and at the same time local government initiated in the provinces. The steady devolution of authority from Suva to local councils (a policy already announced by the Government and strongly recommended by the Burns' Commission) would put an end to the dangerous dependence of the Fijian community on the Administration. Equal representation of the two races in local government is the logical first step in preparing both communities for responsible self-government, which initially

[28] Some institutions such as trade unions have a membership confined largely to people of only one race. Their divisive role in society seems likely to continue as long as various ocupations remain the preserve of one race. A greater mixing of races in various occupations can come only as the result of enlightened educational and economic policies.

[29] In 1959 there were 326 Fijian schools compared to 153 Indian schools in the Colony, though only 53 of the former as against 100 of the later take pupils up to Class 8. Spate (1959): Para. 562.

should be on an equal basis. Indeed, the growing desire for self-government, although still not very strong, may turn out to be an important part of the solution of the Fiji Problem, for a self-governing democracy would seem to provide the best type of social framework in which a truly integrated society will be attained and anarchy avoided.

Thirdly, on the economic plane, it is clear that no stable internal peace will be secured if gross inequalities are indefinitely perpetuated. This means that "the paramountcy of Fijian interests" to which Sukuna referred must inevitably go, though it must be stressed that this should be a gradual process and part of a policy in which every effort is made to increase Fijian productivity to a level comparable to that of the Indians. Fundamentally, the politicians will have to find a politically acceptable compromise on the land question—which is at the base of the whole economy. In this respect there is much merit in the views of the Burns' Commission, which recommends that greater security be given to Indian tenants[30] and that taxation be levied on owners who fail to use adequately any land capable of use. But these hopes and the hope for accelerated Fijian social change seem to be increasingly unattainable as month after month goes by and the Fijian Council of Chiefs (who hold the key to the situation) maintains its reactionary stand, constantly harking back to the Deed of Cession. Indeed the essential factor needed to rescue the Colony from its dangerous situation is lacking—strong, enlightened leadership. One looks in vain for the emergence of a Fijian Nkrumah.[31]

Political advancement should be accompanied by a marked acceleration of economic development, for the Colony's precarious balance of trade remains the most serious and immediate of all aspects of the problem, especially in view of the present saturation of the world's cane market. What is required is a comprehensive development plan that will build in detail on the excellent programme conceived by the Burns' Commission, and estimate the role of all inter-dependent sectors of the economy in the decade ahead. In particular, the Commission suggested that agriculture should be reoriented towards a more mixed type of farming, in which sugar should no longer be grown as a monoculture and cattle and cocoa be farmed in association with coconuts. A vastly expanded coconut replanting scheme is called for, and also the encouragement of Robusta coffee and the establishment of a

[30] The granting of 99-year leases to Indian farmers would give them much more security and yet not violate the Deed of Cession. The Burns' Commission recommends 60 years or 99 year leases where tree crops are involved.

[31] *The Pacific Islands Monthly*, May 1961, pp. 33-6, takes an even gloomier view of the situation. Much of this article was written in August 1960; in the ensuing year little has been done to improve the situation, which accordingly has worsened.

pilot scheme for tea in Vanua Levu.[32]

The fashioning of a viable economy in which growth should be self-perpetuating involves finding finance of the order of £13 million sterling to close the gap between the estimated resources available and what is required. But it also requires major changes in the various components of the economy, which involve most of the elements of the Fiji Problem, for the processes of economic growth derive their momentum from the functioning of these inter-dependent components. Thus it is hoped that the promotion of birth control measures will slow down population growth, the component that is changing most rapidly in the current situation and which aggravates the effects of all the others. Moreover, it must be remembered that any development plan will have to operate in the institutional environment of Fiji; its ultimate success and the amelioration of race relations may well depend on the extent to which it can help to refashion that environment. Without institutional change and Government-sponsored action it is useless to expect the Indians to control their own numbers and freely give up cane growing for mixed farming; equally the Fijians will not free themselves of disincentives still existing in their culture as long as the institutional structure continues to insulate their society from the influence of economic forces. Institutional change is imperative to permit freedom of economic enterprise, to facilitate much-needed capital formation and investment, and above all, to liberate valuable land resources from the social groups in which they are at present locked up. In short, social change must precede or accompany economic change if Fiji is to reach her economic or political "take-off stage". This is the reason for considering economic development in its Fijian context as being almost as much a social as an economic process.

It would greatly help if the Fijian Government could view the problem in its true perspective. Thus it is useful to remember that the process of modernisation in Western Europe became possible only as a result of a weakening of the old nobility, the rise of a middle class, increased social mobility and the greater individualisation of society that accompanied the expansion of trade. The enclosure movement that followed this social change enabled the innovations of the ensuing agricultural revolution to be effective and the whole movement culminated in the

[32] Large-scale cattle and goat ranching have distinct possibilities in the hilly dry zone (especially if aerial top-dressing proves an economic proposition) while concentration on cattle breeding and dairy farming rather than the current ranching should also prove profitable in the lowlands. To these recommendations should be added the specification of a range of cropping systems suited to each land use region (e.g., the regions delimited by Wright and Twyford) from which it would be mandatory for each cultivator to choose. A considerable increase in timber milling is envisaged and one or two possible new industries such as fish canning may be additional money earners. The tourist industry showed its distinct possibilities in 1959 when it contributed over £1,000,000 to the national income.

spectacular transformation wrought by the industrial revolution. This pattern of development is not peculiar to Europe: the recent transformation of the rural landscapes of Kenya described by Elspeth Huxley[33] shows how an enclosure movement following social change in a non-Western society can set in train a full scale agricultural revolution. In the same way once the props were removed in Fiji, society would soon be ready for a programme of consolidation of holdings and a further individualisation of production—a chain reaction process that would culminate in substantial agricultural and industrial progress.

In conclusion, it should be realised that whatever happens in this small island group in the years ahead, the Fiji problem and the principles involved have wider relevance in the world at large. Much could be learned from the experience of Tanganyika and other multi-racial countries. This group, however, is more than an interesting social or economic laboratory in which a significant series of experiments is, or rather should be, taking place. It is primarily a land of living flesh and blood, of men, women and children whose lives are threaded together in dark patterns that threaten to engulf them. If the solution is not found, it is no exaggeration to say that we may have something like a Cyprus in the South Pacific. Already there have been two recent danger signals—the December 1959 riots in Suva, and the sugar dispute between cane growers and the Colonial Sugar Refining Company in August and September last year.[34] Little hope remains for Fiji unless all racial groups, and especially the Fijians, act now, with vision, resolution, and self-sacrifice to subordinate their narrow, sectarian interests to the interests of the Fijian nation as a whole.

[33] Huxley (1960).

[34] Although these two emergencies had their particular causes that sparked them off, their true significance and many of their underlying causes can only be understood in the context of the whole Fiji problem. The deterioration in race relations was marked in both crises, and in the sugar dispute fears were expressed that local forces would not be adequate to prevent violence and maintain order. In opposition to the Indian growers, the Fijian Council of Chiefs declared in August that "Fijians stand ready to assist in the preservation of law and order and in the protection if necessary, of cane growers who are prepared to harvest their crops".—*The Fijian Times,* Suva, 29 August 1960.

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Coal Liquefaction in Japan in World War II

SIDNEY KLEIN

THE 1930s IN JAPANESE HISTORY

It is a common saying that necessity is the mother of invention. If this is true then the development of coal liquefaction techniques and facilities in Japan had decidedly normal origins. Japan in the 1930s was (and still is) a poorly endowed country. With a land area of only 147,000 square miles—about that of California—and a population of over 65,000,000 which was growing at the rate of over 850,000 a year, it was seriously deficient in many natural resources: most notably arable land, metallic minerals (especially iron ore) and fuel and energy sources. With respect to this last major type of deficiency, of the five major sources of inanimate energy—coal, water power, wood, petroleum, and natural gas—it was critically weak in the last two.

The shortage of petroleum was an especially serious matter for a densely populated island nation heavily dependent on imports of raw materials and the export of manufactured goods in its own oil-burning ships. It was intensified still further by the ambitions of Japan's leaders, who as early as 1931 embarked on a program of political and economic expansion designed to create ultimately an "Asia for the Asians" (i.e., the Japanese). Their military preparedness plans in the 1930s called for the rapid and complete industrialisation of Japan and self-sustenance in all major supply matters, including especially petroleum products. However, from 1930 to 1937, the production of crude oil in Japan never exceeded 12 per cent of consumption;[1] it was 1/700 of U.S. production and 1/1000 of world production. Japan ranked twenty-second among the oil producing nations of the world[2] and was clearly embarrassingly dependent on imports from the United States and Indonesia (then the Dutch East Indies).

As a result of this situation, Japan's leaders took two steps designed to remedy both the contemporary shortage and the expected future shortage of fuels and lubricants. Their first step was to establish a large stock of crude and refined oil. By December 1941, they had accumulated

[1] S.C.A.P. Natural Resources Section Report No. 107, 1948, *Petroleum and Natural Gas Production in Japan, 1946 Fiscal Year,* Tokyo.

[2] Cohen, J. B., 1949, *Japan's Economy in War and Reconstruction,* Minneapolis, pp. 133-4.

Sidney Klein is Assistant Professor of Economics at the College of Arts and Sciences, Rutgers University.

43,000,000 barrels. Their second step was the establishment of a synthetic fuels and lubricants industry. It is with this second programme that this paper is concerned. The function of this paper is to evaluate the development of the Japanese synthetic fuels and lubricants industry during the Second World War with respect to technological progress made, costs incurred, and the lessons offered to underdeveloped nations. However, before considering the economics of the problem, let us first consider some of its technological aspects.

PERTINENT TECHNICAL INFORMATION

The generic term, "coal liquefaction" covers the following distinct processes:

(1) Low Temperature Carbonisation (L.T.C.). In simple non-technical language, this refers to the distillation of coal to produce many products, some of which are "final" type, ready for final consumption (e.g., household fuels), and some of which are of an "intermediate" type used in more technically advanced processes (e.g., coalite or semi-coke, an important substitute for coal in coke ovens in Japan). Technically L.T.C. plants do not produce synthetics as the products are not the result of synthesis but rather are the result of distillation. Nevertheless, because of their qualitative and quantitative contributions to coal liquefacation they are classed as part of the synthetic fuels and lubricants industry.

(2) Direct Hydrogenation. In this process, coal, coal tar, or shale oil distillates (all three are alternative raw materials in order of desirability) are reacted with hydrogen at high temperatures and at high pressures.

(3) The Indirect Gas Synthesis or the Fischer-Tropsch (F.T.) process. Coal (or as an alternative, natural gas) is gasified. The resulting synthesis of carbon monoxide and hydrogen is treated under strictly controlled conditions with certain catalysts (e.g., cobalt or thorium) at moderate or atmospheric temperatures.[3]

These three processes complement rather than compete with each other. L.T.C. plants can be and have been used to: (a) produce coalite for use as domestic fuel, in commercial gasification processes, as a charcoal substitute in portable gas-producers on automotive vehicles, and as a substitute for low volatile coal in the manufacture of metallurgical coke; (b) produce and refine coal tar to obtain motor gasoline, semi-diesel oil, and bunker fuel oil, and coal tar suitable for use as a substitute for harder-to-handle coal in the direct hydrogenation process; and (c) produce tar acids, paraffin, naphthalenes and other products used in the chemical and other industries.

The hydrogenation process yields fuel, diesel, and lubricating oils,

[3] British Ministry of Fuel and Power, 1947, *Report on the Petroleum and Synthetic Oil Industry of Germany,* London, Section B, C, D.

and aviation and motor gasoline. The German Bergius process of coal hydrogenation yields an aviation fuel of especially high octane number.

Fischer-Tropsch plants produce low quality motor petrol, lubricating oil, high quality diesel oil, solid wax, and a large number of products used as raw materials in the chemical industry such as synthetic fats, detergents, and alcohols. It is possible to improve the quality of the petrol via secondary and tertiary processes, but this is extremely uneconomical even by synthetic fuel and lubricant industry standards.

Thus, in an economy based on synthetic fuels and lubricants the hydrogenation process would be used to turn out high quality aviation fuel, motor petrol, and ordinary diesel oil; F.T. units would be used to make high quality diesel oil and raw materials for further chemical synthesis; and L.T.C. plants would produce fuel oil, coalite, coal tar, and raw materials and supplies for chemical and other industries.

Given the possibilities noted above, it was only natural that Japan should consider the manufacture of synthetic fuels and lubricants from coal. While total coal reserves in Japan were estimated at less than 17 thousand million tons, at her then current rate of consumption they were sufficient to last for several hundred years and Japan was a net exporter of coal.

THE CONSTRUCTION AND OPERATION OF COAL LIQUEFACTION PLANTS IN JAPAN

In 1937, Japan passed the Synthetic Oil Industry Law. This marked the beginning of a seven-year plan with a production goal of 14 million barrels of synthetic oil annually, or nearly six times Japan's home production of crude petroleum in 1937. Ten Hydrogenation, eleven F.T., and sixty-six L.T.C. plants were to be completed by 1943. In fact, by September 1945, four Hydrogenation, four F.T., and fifteen L.T.C. plants had been completed; one-third of these twenty-three plants were outside the Home Islands. In addition, eight L.T.C., one F.T., and two Hydrogenation plants were in various stages of construction.[4] Fifty-five per cent of capacity was in Manchuria, 29 per cent in Japan Proper, 11 per cent in Karafuto, and 5 per cent in Korea.[5] As the accompanying table indicates, maximum annual production attained was 1.5 million barrels in 1942, less than 90 per cent of the quantity of crude petroleum produced by Japan in that year.

Four to ten tons of coal, depending on the grade used, were required to make a single ton of synthetic gasoline. "Fifteen times as much steel was required for synthetic oil plants as for crude oil

[4] S.C.A.P. Natural Resources Section Report No. 74, 1947, *Low Temperature Combustion of Coal in Japan,* Tokyo, p. 85; Pauley, E. W., 1946, *Report on Japanese Assets in Manchuria to the President of the United States,* Washington, pp. 170-83.

[5] Cohen (1949): 140.

TABLE 1

Japanese Crude Petroleum and Synthetic Oil Petroleum, Inner Zone, 1937-43 (Thousands of Barrels)

Fiscal Year	Synthetic Oil Production			Actual Home Crude Petroleum Production (c)	b/c = %
	Planned (a)	Actual (b)	b/a = %		
1937	550	31	6	2,470	1
1938	920	69	7	2,465	3
1939	3,073	135	4	2,332	6
1940	5,847	150	3	2,063	7
1941	7,816	1,222	15	1,491	63
1942	11,368	1,501	13	1,690	89
1943	14,046	1,048	8	1,814	58
Total	43,620	4,156	9	14,325	28

Source: Planned production from Synthetic Oil Industry Law of 1937; actual synthetic production figures from Imperial Fuel Industry Co.; crude petroleum figures from Japanese Army-Navy Oil Committee, Cabinet Planning Board, Fuel Bureau of Munitions Ministry; all data as reproduced in Cohen (1949): 134, 137.

refineries."[6] Therefore, in locating sites for synthetic fuel and lubricant plants between 1937-45, three major factors required consideration: (1) the nearness of large supplies of coal; (2) the presence of large reliable transportation facilities; and (3) the nearness of large supplies of steel.

Her synthetic lubricating plants were located in or very near the coal, transportation and steel centres of northern Kyushu, western and eastern Honshu, southern Hokkaido, Karafuto, and North Korea, as the tables in the Appendix indicate. All the plants listed in Table A were suitable for the production of synthetic ammonia for use in fertiliser manufacture, and by 1948 several were being utilised.

The Japanese were very anxious to assure themselves of a reliable source of aviation fuel. Because hydrogenation was then the largest and cheapest commercial source of it and they were far from successful with their own hydrogenation process, they attempted to obtain patent rights to the Bergius process and technical assistance from the Germans. Negotiations dragged on and it was not until 1945 that they succeeded in accomplishing this—too late to be of any value to them.

THE GERMAN EXPERIENCE: A SHARP CONTRAST

Germany was the first nation to liquefy coal and up to perhaps 1949 was the most technically advanced in this field. Unlike Japan, Germany had more than ample home sources of high quality bituminous coal, but like Japan was troubled with a petroleum shortage, only 1.4 million tons of crude oil being refined in 1940. Her only important source of

[6] United States Strategic Bombing Survey, 1947, *Oil Division Final Report*, Washington, p. 15.

petroleum was Roumania, which could supply less than one-fifth of her war requirements, and even then the fuel produced from it was not satisfactory for use in aeroplanes. While the first patents for the liquefaction of coal were taken out in 1914 (and were of Bergius type), it was not until 1927 that the first plant was started, nor was it until 1933 that it was completed, and then only because of the stimulus of Nazi Germany's preparations for war.

Unlike the Japanese, the Germans were extremely successful in their attempts to liquefy coal. They had superior processes and better production techniques than the Japanese. The annual rate of production of the German Bergius type plants alone, 3.25 million tons, was nearly twice that of the natural petroleum resources of both Germany and Austria combined, and accounted for all of the aviation fuel, over 40 per cent of the diesel fuel, and over 30 per cent of the motor fuel available to Germany each year.

This large production came from a small number of plants, each Bergius type plant producing 200,000 to 700,000 tons annually. The division of processes and process technology were such that there were distinct economies of scale in their operation. Huge heavy compressors and reactors were constructed. Gases from the reactors were used as motor fuel and in the manufacture of high octane aviation blending agents, synthetic aviation lubricants and chemicals. Bergius type gases were also used to manufacture synthetic rubber.

The Fischer-Tropsch, like the Bergius process, was of German origin, and the rights on it were released to Japan in 1936, 11 years after the announcement of its discovery but only one year after completion of the first plant.

Again the Germans registered far more success than the Japanese. While the F.T. process accounted for less than 10 per cent of the synthetic fuels and lubricants produced in Germany annually, it did, however, produce a large quantity of other materials used in other industries, notably the chemical industry, where, for example, it was used to create synthetic fats and paraffin wax. The Germans found F.T. particularly advantageous because, unlike the Bergius process, which calls for giant plants spread over large areas, the F.T. process lends itself to small units which can be dispersed widely and made less vulnerable to air attack. In addition, the production process is so flexible that it can adjust rapidly to sudden increases or decreases in demand for a wide variety of products and thus avoid time and production losses.

The third method, L.T.C., was in many respects even more important in Germany than the F.T. process and ranked equal to the Bergius process in terms of value to its users. Both the Bergius and F.T. processes are fundamentally dependent on coal carbonisation and gasification. Besides accomplishing the vital function for the Bergius and F.T. type plants, L.T.C. plants supplied nearly one-seventh of Germany's annual oil production, including over 60 per cent of her fuel oil.

As would be expected, the plants were located near sources of coal and/or good rail or water transportation facilities—for example, on the Rhine and Elbe, in the Ruhr, and among the large coal deposits in central Germany.

THE COST OF COAL LIQUEFACTION IN JAPAN

The context in which "costs" is used is important. In wartime, only the "real costs" are important. The coal, steel, manpower, and other raw materials used directly and indirectly in the production processes are compared to their alternative uses in, and value to, the war effort. In peacetime, when market prices for the finished product generally govern production, money costs receive prime consideration.

Coal liquefaction costs have always been high in both contexts. In Germany, where mass production of synthetic fuels reached their physical and technical peaks, four to 10 tons of coal (depending on the grade used) were required to make a single ton of petrol, 15 times as much steel was needed for synthetic oil plants as for crude oil refineries, and the manpower requirements were equally impressively large. Synthetics including coal tar distillation, accounted for over 68 per cent of Germany's annual fuel and oil production in early 1944, before Allied bombings became so effective.[7] At that time, about 200,000 workers were being employed to produce seven million tons of oil per year.[8] In the United States in 1939, some 270,000 persons engaged in the drilling, production, and refining of oil from petroleum, turned out more than 20 times as much. Thus, 35 per cent more people in the United States turned out 2,000 per cent more production simply because of the simpler production processes involved.

In resource-poor, technically-awkward, Japan, the real costs were even greater. Japan was (and still is) weak in such basic materials as coal, coking coal, iron ore, manganese, tungsten, cobalt, almost *ad infinitum*; almost all the essentials of heavy industry were in scarce supply from 1937 to 1943. In addition, her manpower resources were smaller and poorer. In 1940, her population was 72,000,000 against Germany's 80,000,000; further, a larger proportion of Japan's smaller population was in her rural areas. In 1938, 40 per cent of Japan's manpower was engaged in agriculture as against only 29 per cent in Germany. Thus, quantitatively, Japanese manpower assigned to synthetic fuel production drained a non-agricultural personnel reservoir nearly 25 per cent smaller than that of Germany.

Qualitatively, the difference was even greater. Japanese technical and managerial personnel on the whole were inferior to the Germans. They lacked industrial experience and professional *savoir-faire,* and this

[7] British Ministry of Fuel and Power (1947): 2.
[8] United States Strategic Bombing Survey (1947): 15.

was reflected in both the design of their production processes and everyday work on the production line.

Examples of high level technical and managerial fumbling are many. These include failure to account for the tensile strength of tin in the design and production of tin hydrogen peroxide-handling equipment; the use of coal which had a high propensity to cause corrosion and coal breakage in sections of water gas generators; the use of steam for regenerating catalysts (which lowers rather than increases catalyst activity); the designing of equipment to use higher quality coal than was available to Japan; and the failure in aviation fuel production via coal hydrogenation to average yields more than 25 per cent of German yields from the same process.

On the lower level of the production line, operators did not understand the complex structures of and relationships among various pieces of equipment and plants. Deterioration of electrical control systems through poor maintenance and stripping of irreplaceable key equipment to maintain relatively unimportant, more easily replaced equipment were typical reactions to the everyday problems of production. Such inefficiency added to the already high real costs of production and sent money costs soaring even higher above their usual uneconomic levels. At the Kirin coal tar hydrogenation plant in Manchuria, for example, it cost $.71 per gallon just to produce the coal tar,[9] to say nothing of what the cost of producing petrol from the tar would have been, had the plant been finished and mass production achieved. By way of contrast, in Germany petrol produced via coal hydrogenation is estimated to have cost less than 50 per cent of the cost of coal tar alone in Japan.[10]

COAL LIQUEFACTION IN JAPAN AND ECONOMIC DEVELOPMENT

Both from a technical and an economic standpoint, wartime Japan's experience with coal liquefaction was an unprofitable one. Inadequate natural resources, insufficient competent technical and managerial personnel, war, and just plain bad luck combined to produce very poor results. If nothing else, a body of technical information of a negative character was added to the history of coal liquefaction technology, and from that point of view if no other, man in a broad sense, as well as the Japanese, moved forward.

In the case of Japan in the 1930s and 1940s, and underdeveloped nations generally in the 1960s and 1970s, aspirations concerning economic development are not enough. In addition to the basic resources needed for technological development, high quality technical

[9] Pauley (1946): 178. Conversion at the rate of 4.26 Yen to the U.S. dollar.
[10] British Ministry of Fuel and Power (1947): 8.

and administrative personnel at all production levels are necessary. It is not enough for the national government to direct that economic and technological developments along certain lines be pursued; equally importantly, personnel must be available who can recognise the limitations and requirements as well as the capabilities of the equipment. In short, if economic development is to be furthered by technological progress, then better, more responsive people as well as better, more responsive machines must be developed. The development of coal liquefaction in Japan in the 1930s and 1940s illustrates strikingly the problems which arise when only the latter are present.

APPENDIX

TABLE A

Low Temperature Carbonisation Plants in Karafuto and Korea, 1937-45

Name — Location	Chief Factor in Location	Rated	Maximum Obtained
Teikoku Nenryo Kogyo KK—Naifuchi, Sakhalin	Coal	Gasoline refinery—315 bbl. per day; tar —2,516 bbl. per day	Coalite — 150,899 tons; motor gasoline — 1,351 tons; bunker fuel oil —25,843 tons; all in eighteen months, 1943-45
Teikoku Nenryo Kogyo KK—Naihoro, Sakhalin	Coal	N.A.	Coalite — 611,481 tons; motor gasoline — 9,113 tons; gas oil—8,196 tons; semi-diesel oil — 25,876 tons; bunker fuel oil— 21,845 tons; all 1940-45
Chosen Jinzo Sekiyu KK—Agochi, Korea*	Coal	N.A.	Gasoline—629 bbl. per year; liquid fuels— 123,787 bbl. in 1942; methanol—80,770 bbl. in 1944
Nippon Chisso Kogyo KK—Eian, Korea	Coal	N.A.	Gasoline—58,604 bbl. of liquid fuel produced in 1942-45

* Plant had a hydrogenation plant in the experimental stage.

Source: SCAP Natural Resources Section Report No. 74, pp. 73-87.

TABLE B

Synthetic Oil Plants in Japan Proper, 1937-45

Company	Location	Chief Factor in Location	Annual Capacity Prior to 1945 (Barrels of Crude Oil)
L.T.C. Units			
1. Nippon Seitetsu	Muroran, Hokkaido	Coal, iron and steel centre	44,030
2. Tokyo Gasu Kagaku	Yokohama Honshu	Joban Coal; port city; RR; consumers	25,160
3. Nihon Yuka Kogyo	Kawasaki, E/Honshu	Joban Coal; port city; RR; consumers	23,902
4. Toho Kagaku Kogyo	Nagoya, E/Honshu	Consumers; port city; RR	25,160
5. Ube Kosan	Ube, W/Honshu	Ube Coal	89,318
6. Nenryo Kogyo	Ube, W/Honshu	Ube Coal	245,310
7. Nissan Ekitai Nenryo	Wakamatsu, N/Kyushu	Coal; port city	207,570
		TOTAL	660,450
Hydro Cracking Units			
1. Nippon Yuka Kogyo	Kawasaki, E/Honshu	Joban Coal; port city; RR; consumers	8,177*
2. Toho Kagaku Kogyo	Nagoya, E/Honshu	Consumers; port city; RR	163,540
3. Nenryo Kogyo	Ube, W/Honshu	Ube Coal	62,900†
		TOTAL	234,617
Fischer-Tropsch Units			
1. Nippon Jinzo Sekiyu	Takikawa, Hokkaido	Ishikari coal	90,576
2. Nippon Jinzo Sekiyu	Amagasaki, E/Honshu	Joban coal; port city	25,154
3. Nippon Jinzo Sekiyu	Omuta, Kyushu	Miike coal; port city	90,576
		TOTAL	206,306
		FINAL TOTAL	1,101,373

* Gasoline † Gasoline Plant Under Construction

Source: Overseas Consultants, Inc., *Report on Industrial Reparations Survey of Japan to United States of America*, Feb. 1948, exhibit 11.1. Data converted from kilolitres to barrels at rate 1 kilolitre = 6.29 barrels.

TABLE C

Synthetic Oil Plants in Manchuria, 1937-45

Name — Location	Chief factors in Location	Capacity Rated	Capacity Actual
L.T.C. Units			
1. Japanese Army 2nd Fuel Depot—Chinhai, Liaoning Province*	Chinhsi coal; port of Hulutao; RR	39,000 bbl. of tar	22,000 bbl. in 1944
2. Coal Tar Hydrogenation Kirin Plant of Manchuria, Synthetic Petroleum Ltd.—Kirin, Kirin Province†	Yungchi coal; South Manchuria RR	Crude Methanol, 15,000 tons per year; tar, 10,000 tons per year; coalite, 130,000 tons per year	8,400 bbl. of tar; 18,900 tons of coalite; both as of 1944
3. Tashihchiao Plant, S. Manchuria Mining Co. Ltd.—Tashihchiao	South Manchuria RR; port of Yungkou; Anshan iron and steel; magnesium	6,000 to 100,000 tons of tar	None
4. Harbin Plant, Sutan Ind. Co.—Harbin	South Manchuria RR	4,000 tons of tar, 80,000 tons of charged coal briquettes	None
Hydro Cracking Units			
1. Coal Tar Hydrogenation Fushan Plant‡—Fushun	Fushun coal; South Manchuria RR; Anshan iron	130,000 bbl. of fuel per year	28,000 bbl. of fuel in 1944; 500 bbl. of synthetic methanol in 1944
2. Manchu Research Institute for Coal Hydrogenation—Mukden, Liaoning Province§	Fushun coal; South Manchuria RR; Anshan iron; availability of labour	13,000 bbl. of aviation gas per year	None
Fischer-Tropsch Units			
1. Synthetic Fuel Co. Ltd. —Chinchow, Liaoning Province‖	Foushin coal; port of Hulutao	30,000 tons of gasoline, diesel fuel and wax	881 bbl. (of very poor quality) in 1944

* Depot contained also uncompleted petroleum refining facilities, a synthetic lubricating oil plant and many other auxiliary facilities. Originally cost $15.5 million.

† Also contained uncompleted direct hydrogenation (Bergius-type) equipment valued at $2.1 millions. Ninety-five per cent of the entire plant was stripped by the Russians.

‡ An experimental pilot plant for the hydrogenation of oil from coal tars. Original cost of the plant is estimated at $150,000; of which equipment worth one-third was removed by the Russians. Plant capacity was reduced to zero.

§ Its equipment was of German design and manufacture. Details of its construction were top secret. Soviet Russia removed all of its equipment and Japanese staff personnel and all records of plant design, operation, and cost. Total value estimated to have been $750,000 to $1,000,000.

‖ Begun in 1936 but not completed until 1944 because of the difficulty of transporting the equipment from Germany.

Source: Pauley, E. W., *Report on Japanese Assets in Manchuria to the President of the United States*. July 1946. pp. 170-183.

Historical Aspects of Settlement in British Borneo

Y. L. LEE

INTRODUCTION

In prehistoric times, and also to a certain extent today, the dominant geographical control in the peopling of British Borneo has been the massive compactness of the island of Borneo and its position in the Archipelago. Both features have contributed much to the sparseness of settlement in the interior, and peopling has taken place only along the coastal fringes. After the separation of Borneo from the mainland, the island remained isolated for a long period, during which time there were no important population accessions although the same population on the mainland was receiving further Mongoloid infusions. In modern times, too, Borneo has been isolated from the main seaways, and British Borneo at the northern extremity has always received the last faint ripples of all human migrations and influences. The early Indian and Arab infiltrations of the neighbouring islands affected the northern area but little and had only slight influence on the Sarawak and Brunei coasts. Similarly, the later European conquests dissipated their energies in the islands first encountered, leaving British Borneo untouched except for its coastal fringes.

Because of its position, it is doubtful whether the successive waves of Negrito, Australoid and Proto-Malay (Indonesian) migrations after the Ice Age (25-50,000 years ago) ever affected Borneo as they did other parts of the Archipelago. Hose [1] is of the opinion that Negritos did reach Borneo but Rutter thinks otherwise. No survivors of any Negrito stock have been found in Borneo and "it seems reasonable to suppose that had any Negrito tribes ever existed in Borneo they would have had better chances of surviving in the remote lonely forests of the hills, than in Malaya or the Philippines whither came wave after wave of settlers." [2] Others have suggested that circuitous land connections in this part of the world seem to offer the most likely means of Negrito distribution in the Archipelago and may account for their absence in Borneo while they are present in nearby Palawan

[1] Hose and McDougal (1912): 28.
[2] Rutter (1929): 20-21

Y. L. Lee is Lecturer in Geography at the University of Malaya in Singapore.

Islands. But whether or not Negrito tribes ever did exist in British Borneo, the present day peoples appear little influenced by these earlier peoples, either racially or culturally.

Since there is little evidence of earlier inhabitants in British Borneo, the last wave of peoples in the series of migrations into the Archipelago in prehistoric times — the Proto-Malays or Indonesians — can be taken as the aborigines of the country. These early ancestors of today's indigenous peoples are believed to have migrated from Asia, and belong to a branch of dolichocephalic Indonesian race prevalent in this part of the world. They are thus racially closely allied to most of the inhabitants of the surrounding islands and "their survivals are to be found in the Punans, Kenyahs and Klemantans of today." [3]

It is possible that the earliest of these settlers reached an uninhabited Borneo or one sparsely inhabited by small groups of peoples isolated by the break-up of Borneo from the mainland. They established their first settlements along the coast at estuaries, initiating a pattern which has persisted to the present. Later, with the arrivals of further immigrants, the early settlers and the weaker communities must have been displaced into the interior and there dwelt secure in their forested fastness. The Penans, nomadic Punans, Muruts and most of the smaller interior tribes, may represent the descendants of such groups displaced by later arrivals. These ancestral Indonesians (1-2,000 years before Christ) brought with them a technology of wood and stone implements. Others, having been influenced by fresh infusions from Asia in their island homes during the period when Borneo was isolated, were primitive padi farmers, using stone tools and the dibble stick with which they cleared the land and farmed. The methods of shifting cultivation which they introduced still continue in use in many parts of Borneo. And, until recent times, most of these peoples have lived for centuries untouched by the alien "invasions" that affected the rest of the Indonesian world since the days of the early Indian traders.

EARLY INDIAN CONTACTS

During the early years of the Christian era, traders were active in much of Southeast Asia and were sailing particularly in the Malacca Straits. Borneo was also well within the Indian trading and later "colonization" movement, [4] but all early Indian settlements were remote from the northern part of British Borneo, being largely centered around the east and southwest of Borneo [5] where gold attracted foreign incursions. [6]

[3] Hose (1926): 3
[4] Sastri (1949): 16.
[5] Braddell (1941): 74.
[6] Braddell (1941): 2.

Braddell believes that there were very ancient Indian or Indianized kingdoms in the east, and that being so, it was inconceivable that the easiest coast to reach and the district which had important mineral wealth in the shape of gold, diamonds and other minerals and which by reason of its rivers and its fertility was most suitable for settlement, was not settled prior to the establishment of colonies in the east and southwest. He suggests "that among the earliest places in Malaysia settled by the ancient Indians must have been the region between the Kuching and Pontianak and the regions watered by the Kapuas and Sambas." [7] Quaritch-Wales, however, says that "there is reason to believe that there was no rich state in Borneo comparable to the famous neighbouring kingdoms that made a greater mark in history. Consequently, Indo-Bornean architecture may never have got beyond wood or semi-perishable construction. Stone or brick temples would probably have been discovered by now." [8] Whatever the case may be, it is likely that a great part of British Borneo, being away from the main trading areas, was little affected by Indian traders and settlers. In fact, existing evidence suggests that there were no large scale Indian settlements in west Borneo, [9] which was further away from the main stream of Indian trading and colonizing activities.

However, where there are traces of Indian settlement in west Borneo they have been found close to a tidal stream or on the low-lying area connecting the gold fields of Sambas and Bau. Practically all the objects and sites are on the Sarawak River system and the associated Samarahan River, in the Kuching area, or in the vicinity of Brunei. [10] It therefore appears that large scale activity by Indians went on only in Sarawak approximately a thousand years ago, [11] not reaching and affecting the northern part of the country at all.

During the heyday of the Buddhist kingdom of Srivijaya in Sumatra (c.800 A.D.) west Borneo was probably a favoured stopping place on the long voyage from India to China. British Borneo was subject to Srivijaya at that time. But after the rise of the Hindu-Javanese empire of Majapahit (c.1300 A.D.) most of Borneo came under Javanese influence and regular tribute was exacted from the British Bornean coast. However, there are no indications that Srivijaya had more than an ephemeral influence in British Borneo. On the other hand, indications of contact and influence from Majapahit are quite numerous and strong, [12] both through material objects and through legends and traditions which most probably emanated from Java. [13]

[7] Braddell (1941): 70.
[8] Quaritch-Wales (1949): 31.
[9] Harrisson (1949): 100.
[10] Banks (1947): 30.
[11] Harrisson (1955): 516.
[12] Harrisson (1949 B): 103.
[13] Hughes-Hallett (1940): 25.

The direct influence of both kingdoms on the settlement or the peopling of the country appears from existing evidence to have been small.

EARLY CHINESE CONTACTS

Neither did early Chinese contacts leave any lasting marks on settlement in British Borneo. Between 600-1500 A.D. there are numerous references in Chinese dynastic histories to embassies from Borneo, [14] but no large scale settlement activities are mentioned, although excavations in the coastal zone of Sarawak have revealed predominantly Chinese occupation or trading during the early centuries of this millenium. [15] This Chinese period overlaps in time with the Majapahit era (c.1300-1500 A.D.) which was then followed by the coming of Islam.

Existing evidence does not make it possible to suggest anything more definite about Chinese influence in this part of the world prior to the fifteenth century. However, in the fifteenth century when there was much trading between China and Brunei, it was inevitable that some members of the trading expeditions should elect to stay in Borneo. There are records both in Brunei and Sulu annals that there was a Chinese Colony on the Kinabatangan River in the fifteenth century commemorated perhaps by the name of the river. [16]

Like the early Indian contacts and notwithstanding the many Chinese legends and names associated with the country, this early Chinese contact left little impression on the present day landscape. Not until the late nineteenth and early twentieth century did Chinese settle in some numbers and effect a change in the pattern of settlement. Harrisson sums it up well when he says that "probably in the past, as now, the main Chinese influence has been secular, artistic and economic during the Christian era. It is symbolic enough that one of the definitely Chinese legends in Borneo tells how the emperor's sons came to remove the jewel guarded by the dragon at Mount Kinabalu." [17]

OTHER PRE-EUROPEAN CONTACTS

During the three or four hundred years before the coming of the Europeans, Borneo received from Malaya and other islands of the Archipelago colonists who settled mostly along the coasts. Although Malay colonization of Borneo was preceded by the Hindu-Javanese, the

[14] Braddell (1949 B): 5.
[15] Harrisson (1955): 512.
[16] Hughes-Hallett (1940): 27.
[17] Harrisson (1949): 100.

flourishing condition in which Brunei was found at the beginning of the sixteenth century, and the purely Malayan character of it, suggest that its origin was long before the final establishment of Islam in Java (1478).[18] These newcomers were seafaring people and confined their influence to the coastal and riverine areas. The northern part of British Borneo was most probably affected from two ends in the west by Malay influence and in the north by Sulu. The interior, however, was barely touched.

The fall of Majapahit and the arrival of Islam from Malacca saw the advent of several Muslim dynasties in Sambas, Soekadana, Landak, Bandjermasin and Brunei. The Sarawak and North Bornean coasts were subject to the Sultan of Brunei.

Thus, when the Europeans arrived, the coasts had long been occupied by Muslim people of Malay culture who were dwelling for the most part in villages along the coast or near estuaries. Those living on the west coast owed allegiance to the Sultan of Brunei and a number of minor rulers, local rajahs and pangirans, whereas the Sultan of Sulu had sovereignty over the northern part of the country.

At this time (1521), Pigafetta visited the island and gave a glowing report of the capital. He found a population of 25,000 families and the town built over water,[19] but no mention was made of other Bornean settlements. This favourable report was confirmed by earlier (1518)[20] and later visits of the Portuguese who also saw large numbers of Chinese settled along the shores and a considerable junk trade between Brunei and China,[21] a trade which was to die out with the advent of piracy in these waters and English and Dutch competition. This once considerable trade was dealt a mortal blow, but even at the end of the nineteenth century old docks capable of berthing vessels of 600 tons[22] were noted at Brunei. However, no signs of these remain, and the Chinese pepper gardens which extended right inland to the slopes of Gunong Mulu have long disappeared. The loss of this Chinese trade had severe repercussions in Brunei and

> "it prevented large bodies of annual immigrants from setting upon her shores; it deprived them of an opportunity of visiting the Bornean ports, and exercising their mechanical arts and productive industry; and of thus keeping up the prosperity of the country in the tillage of the ground, as well as in the commerce of ports. The old Chinese settlers by degrees deserted these shores."[23]

In fact the loss of this trade saw the beginning of Brunei's end.

[18] Logan (1848): 514.
[19] Hunt (1847): 3.
[20] Logan (1848): 514.
[21] Hunt (1847): 2.
[22] Hunt (1847): 3.
[23] Hunt (1847): 3.

EUROPEAN CONTACTS

The arrival of Europeans therefore saw the steady decline of Brunei. The first on the scene to witness this decay were the Spaniards who might have annexed North Borneo and the whole of Brunei. Because of their proximity in the Philippines and Sulu islands, they were constantly in the vicinity during the sixteenth and seventeenth centuries. But, fortunately for Brunei, they were too occupied in subduing the Sulus and with the trade of the Moluccas to be actively concerned with Bornean territories. The Palawan islands, however, were eventually ceded to the Spaniards.

During the same period the Portuguese were also around Brunei, paying the town many visits in the course of their vigorous trade. But like the Spaniards, their interest was also in the Spice Islands and in the south. Whatever contact was made, was made purely as a trading proposition, although Hunt has pointed out that there are remains of two bastions and a stone fort in Brunei and one at Labuan built by the Portuguese.[24] On the other parts of the British Bornean mainland no indications of a similar nature are to be found. Like the Spaniards, the Portuguese did not leave any lasting effects on settlement in British Borneo.

Later arrivals of Dutch and English were more interested in the south and southwest of Borneo (Sambas, Pontianak, Sukadana and Bandjermasin) where pepper and diamonds attracted both Dutch and English traders. Trading settlements only were made in these ports, and all were eventually withdrawn. British and Dutch commercial interests at this time did not reach British Borneo at all.

Nothing more definite came about until 1763 when the English captured Manila and freed the Sultan of Sulu from Spanish hands. As a *quid pro quo* he ceded the whole of what is now North Borneo to the East India Company, the same territory which the Sultan of Sulu acquired in 1622 from the Sultan of Brunei as a reward for helping to quell a rebellion.[25] Even then it was not until 1773 that a British settlement was established in Balambangan Island north of Marudu Bay. The island was selected because it was thought to be a convenient halting place for ships plying between India and China and a strategic base protecting the flank of the China trade. It must be noted, at the outset, that British interest from then until today has tended to be concentrated for strategic reasons on the northern part of Borneo, while the Dutch for commercial reasons have concentrated on the south and southwest.

Balambangan was attacked by Sulus in 1775 and was abandoned. A second attempt to re-establish the settlement in 1803 failed and

[24] Hunt (1847): 3.
[25] Hughes-Hallett (1940): 33.

it was finally abandoned in 1804. Thus ended the first attempt at colonising British Borneo. No further attempts at colonisation by Europeans were made until the arrival of James Brooke in 1839.

EXPLORATION

With the coming of Brooke's rule and the Chartered Company, and with the gradual annexation of territory by both, establishment of ordered government became rapid and satisfactory progress was achieved. Explorers were beginning to explore the country and in north Borneo young Englishmen were also penetrating and peacefully administering large provinces along the west and east coasts. As a result, by the late nineteenth century much more of the country's interior and coastal areas became known. Before that time, however, very little was known about the interior and even the coastal areas, a fact which was reflected in maps of the period before explorations began. Further knowledge came only with explorations which started earlier in Sarawak (1840s and 1860s) than in north Borneo (1860s). Such explorations are still going on today.[26]

Accounts of all these early exploratory journeys emphasised the importance of rivers as lines of movement. The routes, if they did not follow the stream course entirely, at least followed it for some distance until some suitable vantage point was reached for crossing the mountain divide. Witti in this third journey in 1882, travelled up the Kimanis to its source, thence over the Crocker Range, down the whole length of Pampang River into the Kiningau Plain until Limbawang. This is but one example of the numerous occasions when explorers had to take a route of this kind.

In Sarawak, the early explorers also depended entirely on rivers which still form the chief highways of the country today. Burns (1849), one of the earliest explorers, travelled up the rivers Tatau, Kemena and Baram and furnished information about the upper reaches of these rivers and also the first reports of the Kajang settlements along the Baram. [27]

Hugh Low (1848) explored the Sarawak river system and paid special attention to mineral resources. It was however, Spenser St. John who gave the most detailed reports of Sarawak and North Borneo. He travelled extensively over most of the second Division rivers and was the first European to be in the area. There were also his trips up to the source of the Sarawak River, the Baram, Limbang, Kanowit and Rajang which were well described by him. In addition, he travelled along the coast of North Borneo from Kimanis to Sibuco

[26] Harrisson (1959): 299-311.
[27] Logan (1848):

and climbed Kinabalu. He was not only able to record these travels but, from information gathered during these journeys, he also produced a map as well.

O. Beccari (1865-68) can be classed as one of the first travellers of Sarawak. He crossed the country through its whole length, traversing the basins of the rivers Bintulu, Rajang, Lupar, Sadong and Sarawak. He was, however, a botanist and his journeys did not furnish much new matter of geographical interest.

However, it must be noted that all these explorations were concentrated on the coastal stretches of the rivers, particularly those of the First and Second Divisions, which are the best known today. The interiors of the Third, Fourth and Fifth Divisions of Sarawak and the great southern interior of North Borneo were not penetrated by earlier explorers and today still remain the least accessible and known parts of Britsh Borneo. Recent explorations by Harrisson and Leach, [28] by geologists and other government officials have brought forth more information on these interior areas. [29]

Aerial photographs by the Royal Air Force have also helped to give a clearer idea and picture of the interior.

In the North Bornean explorations, however, greater attention was focussed on the Central High Plains, the northern and the northeastern parts of the country which form today the better known interior areas of the country. For example, Witti in 1880 began several journeys into the interior, marking the beginning of exploration into the High Plains when he reached Tambunan and Keningau in his first and third journeys. In his second journey he explored the northeastern part of the country crossing overland from Bongon in Marudu Bay to Sandakan using the Bongon, Labuk and Lokan rivers for most of the way.

Frank Hatton was the other great explorer of the country. Both he and Witti died in the course of their travels. Hatton (1881) concentrated on the northeastern area and pursued his task by following all the major rivers there very far up to their sources: Labuk, Kinabatangan, and Segama. Pryer also explored the Kinabatangan in the same year. By their journeys both these pioneers called attention to the fact that the rivers form excellent highways into the far interior of North Borneo.

Although many of the journeys into the interior were concerned largely with the geology of the area, [30] it is important to emphasise the fact that the opening up of stations in those remote areas and the

[28] Harrisson and Leach (1954): 65.
[29] Harrisson (1959): 299-311.
[30] Posewitz (1892): 56-69.

development of settlement owe much to the journeys of discovery by Burns, Low, St. John, Witti, Hatton, Pryer and others.

BRUNEI

The Sultan of Brunei exercised only nominal control over his territories in North Borneo and Sarawak after the withdrawal of British interests. This control was largely exercised through the medium of Malay nobles who were unchecked in the exercise of their powers. Settlements were along the coasts and around river mouths, each under the overlordship of a feudal chief. These coastal settlements were in many cases pirate lairs and were hemmed in on one side by the sea where pirate fleets sailed the seas unchecked, and on the other, by the forested and mountainous interior where primitive, hostile tribes practiced headhunting.

Only when James Brooke arrived in 1839 was piracy dealt a mortal blow by ships of the Royal Navy. With the pirate menace over, the Sultan ceded Labuan (1846) to the English, an event which marked the end of early colonizing attempts and the beginning of modern British Bornean colonization.

Though the seas were clear of piracy, in the settlements along the coasts internal dissension was still marked, and kampongs were hostile towards each other. Central government at Brunei was still a shadow and taxes were collected by unscrupulous agents. The chieftaincies shaped around estuaries in Sarawak and North Borneo were under Malay nobles or governors who recognised no authority but their own, "an authority so abused that one by one the various districts became disaffected, some to the point of rebellion, and no longer more than nominally bore the yoke of Brunei." [31]

It was into such an atmosphere of lawlessness that James Brooke and the forerunners of the British North Borneo Chartered Company stepped. During the next half century there was a virtual partition of Brunei at the hands of Brooke and the Chartered Company, and thereafter until the Japanese occupation came the period when there appeared changes on the landscape large enough to be registered. The changes which took place during these first four decades of the twentieth century had a markedly greater effect on settlement than did all the earlier centuries of foreign incursions starting with the first Indians.

During the early years the indigenous population was small, roughly five to a square mile and estimated in 1890 at 160,000. [32] This scanty population was due to the absence of a central government and the presence of all forms of lawlessness. In more recent years, diseases

[31] Hughes-Hallett (1940): 85.
[32] Treacher (1890): 85.

such as cholera and smallpox have annihilated large numbers. These people "had little organization beyond that of a chief who controlled a few riverine villages. Over him was the absentee deputy of the Sultan of Brunei on the west coast, or the Sultan of Sulu, on the east, the possessor of the rivers. The Brunei lords in particular had each an agent controlling their allocated river, depriving the chiefs of nearly all authority and the people of all their sustenance." [33]

No large settlements were to be seen on the landscape, except perhaps the amphibious Brunei town which had seen better days. The large population of 40,000 with 30,000 Chinese pepper planters in the first two decades of the eighteenth century had dwindled to 15,000 in 1809. By 1847, there were only 12,000 and the Chinese had entirely disappeared. Nothing remained of its past glory and nothing was to change the settlement pattern during the latter half of the nineteenth century and the first decade of the twentieth, when the country was slowly but surely being annexed by Brooke in the south and the Chartered Company in the north (Fig. 1).

Brunei had practically ceased to be a viable political entity when the British Government established a protectorate over it in 1889. In 1906, a Resident took over most of the administration of the country, but even this did not bring about any remarkable changes on the landscape until the discovery of oil at Seria in 1929. It was not only a major event in Brunei's history and to its economy, but it also brought about vast changes in the population numbers and composition. Prosperity also saw the creation of new towns and the construction of roads and buildings throughout the country. The process of change as a result of this oil boom is still going on today, and the settlement pattern is fast being changed. But more than anything else, "oil not only has greatly increased the prosperity of the little state, it has had fateful consequences for all British Borneo, consequences swinging the area even more definitely into the great cross-currents of international affairs." [34]

SARAWAK

When James Brooke was offered Sarawak Proper in 1841 after helping Rajah Muda Hassim to quell a rebellion, the territory under his control came to only about 3,000 square miles with a coast line of 60 miles and comprising roughly what is now the First Division. At this time, as along most of the Bornean coast, "nearly every district belongs to some particular family, which by usage possesses an almost unchallenged power over the people, and is thus removed from the control

[33] Tregonning (1958): 105.
[34] Country Survey Series (1956): 16.

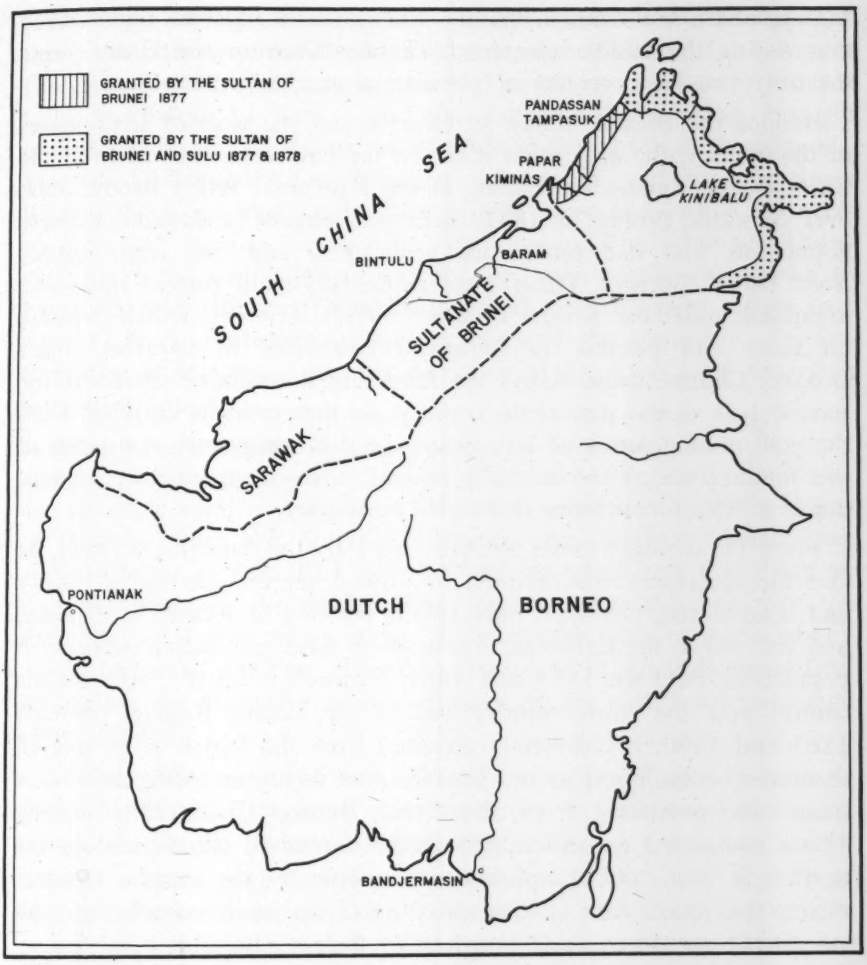

Fig. 1. Political Boundaries of Borneo.

of the Government. Many districts are divided among the various families who have each certain villages, and live on the amount they can obtain by taxes or forced trade." [35]

Population was estimated at between 10,500 inhabitants, consisting mainly of coastal Malays (1,500), Chinese traders and gold miners (1,000) and Land Dayaks (8,000) in the interior hills. [36] Kuching then consisted only of about a dozen crude huts, some with stockades, close to the muddy bank of the Sarawak River. It was very much a pioneer-looking place, untidy and transient, with a population of 1,000

[35] St. John (1863): 271.
[36] Rutter (1935): 308.

Malays and a few Chinese traders. Even then, it must be remembered that during the middle nineteenth century Kuching and Brunei were the only two large centres of population and political influence.

Besides the coastal Malay settlements and the isolated long-houses of the interior, the only other mark on the landscape was made by the Chinese gold mining settlements in the Bau area. When Brooke took over Sarawak Proper in 1841 there was already a sizeable Chinese population who had settled for generations and had come mainly from Dutch Borneo. These were principally gold miners and were organised under the Kongsi system.[37] With increased Dutch pressure on them and because of improved conditions in Sarawak under Brooke, Chinese came across the border in a continual stream in the second half of the nineteenth century, so that even as early as 1856 the gold mining centre of Bau was quite a bustling town consisting of one hundred shops and as many houses.[38] In all, there were an estimated 4,500 Chinese living in the gold mining area.

From the moment James Brooke took over the Sarawak territory, he and his successors concentrated in wiping out the scourge of piracy and headhunting practices. Such efforts resulted in security and peace, and also led to the territorial expansion of Sarawak and an increase in population. Between 1853 and 1861, Sarawak gradually extended its control over the entire country west of the Betong Rajang. Between 1861 and 1890, it completely acquired from the Sultan of Brunei all territories as far north as the Trusan. And finally in 1905, the Lawas basin was purchased from the North Borneo Chartered Company whose southward expansion and similar territorial acquisitions in the north had been looked upon with suspicion by the Brooke Government. The total result is that today only two small enclaves of land are left of the once proud kingdom of Brunei (Fig. 1).

NORTH BORNEO

During the period when Brooke was busy suppressing headhunting and extending his territory, the west coast population of North Borneo at this time (1860s) were principally the Illanuns, Bajaus and Dusuns. All three groups were concentrated in roughly the same area. Illanuns had populous settlements on the Tuaran, Tempasuk, Pandassan and Layer Layer. Bajaus were scattered all along the coasts with principal settlements at Mengkabong and Tempasuk. Dusuns, on the other hand, were found in large numbers on the banks of the Tuaran. All these coastal groups on the west totalled no more than 50,000.[39]

[37] Spencer St. John (1863): 349-353.
[38] St. John (1863): 349, 353.
[39] St. John (1863): 381.

Into this setting came the first attempt at Western settlement on the north Bornean mainland. The American Trading Company of Hong Kong which had brought from C. Lee Moses a concession secured from the Sultan of Brunei and the Pangeran Tumongong, brought in 60 Chinese and 12 Americans to settle at the mouth of the Kimanis. This was "Ellena" the first "western" (American) settlement in North Borneo.[40] A stockade and a flimsy jetty were built while 90 acres were cleared for rice, sugar cane and tobacco. The settlement, however, stagnated and failed to prosper for "with hardly any money to buy food, and with very little rice stored in the settlement, slowly they starved."[41] A tombstone of the Secretary of the Company, Thomas B. Harris, at Kimanis is the only indication today of this early American Settlement (1866).

With this American failure, no further settlement attempts were made for another ten years. But in 1877 and 1888, Overbeck, Cowie and the Dent brothers succeeded, on annual payments, in getting grants of territory from the Sultan of Brunei, the Pangeran Tumongong and the Sultan of Sulu. This grant of land stretched from Gaya Bay on the west coast to the Sibuko River on the east, together with the Kimanis and Benoni rivers, some 28,000 square miles of land embracing 300 miles of coastline. This first acquisition of North Bornean land was to see the beginning of vast changes on the west coast landscape (Figs. 2 and 3).

This acquisition of land was followed by posting of men in strategic spots, Sandakan, Tempasuk and Papar, by a Provisional Company formed to run the country. But this acquisition by a shadowy British concern aroused protests from Spain, Holland, U.S.A. and Brooke of Sarawak. Nevertheless, the British Government with strategic considerations again in mind granted a Charter to the Company in 1811, because by so doing the flank of the immense British trade with China would be protected.

In spite of the large area under the Company's control, development was still difficult because of the many independent rivers forming enclaves embedded in Company territory, sources of irritation and inconvenience. The Company, therefore, from 1889 onwards until the end of the nineteenth century gradually annexed all the independent rivers owned mainly by these absentee landlords living in Brunei or by Chieftains. A few of these annexations were the result of punitive expeditions that the Company was compelled to undertake. The last enclave to be acquired was the Membakut district which was ceded by an independent chief in 1902. The expansion southward for a time came into conflict with Brooke's northward movement to annex Brunei.

[40] Tregonning (1954 A): 357-72.
[41] Tregonning (1958): 6.

ECONOMIC DEVELOPMENT: SARAWAK AND BRUNEI

James Brooke had three objects in mind after taking over Sarawak: (1) the relief of the Land Dayaks from oppression; (2) the suppression of piracy; and (3) the suppression of headhunting practices. Although he was successful in achieving these objects eventually, they were not achieved immediately but over a period of years. The immediate results can best be summed up in Keppel's words: "In 1842, piracy, slavery and headhunting were the order of the day. The sail of a peaceful trader was nowhere to be seen, not even a fisherman, but along the length of this beautiful coast, far into the interior, the Malays and Dayaks warred with one another. Now (in 1867) how different. Huts and fishing stakes are to be seen all along the coast, the town of Kuching, which on the visit of the *Dido,* had scarcely 800 inhabitants, now has a population of 20,000. The aborigines, who called themselves warriors, are now peaceful traders and cultivators of rice. The jungle is fast being cleared to make way for farms." [42] The suppression of piracy also brought about an increase of trade, the tonnage of merchant vessels in 1852 having risen to 25,000 tons, whereas in 1842 the whole trade was carried on by a few native *prahus.*

The establishment of peaceful conditions and Brooke's policy led to large scale Chinese settlement in the upper Sarawak district around Bau where they worked the gold mines. Even after the insurrection of the Chinese in 1857, Brooke still encouraged Chinese to come into the country. There was a scheme for introducing Chinese pepper and gambier planters into Sarawak. This started in 1878-9 and was very successful, but the government wanted still more Chinese immigrants and did not understand why larger numbers had not availed themselves of the terms offered. Neverthless, the Chinese farmers were changing the landscape with their agricultural activities, a process in which they were helped by many of their gold mining compatriots who turned to farming when visible outcrops of gold gave up after 1857. The revival of the gold mining industry after the insurrection never reached its previous proportions, so that more and more Chinese turned to the more profitable occupation of pepper planting. And at the turn of the century "the mining district of upper Sarawak had been changed into an agricultural one — gold mining had almost ceased . . . whilst pepper gardens had sprung up everywhere." [43] Moreover, there was an improvement of the country's financial position, chiefly "due to the influx of Chinese, especially of gambier and pepper planters, who were attracted by the liberal concessions of land and monetary assistance." [44]

[42] Baring-Gould and Bamfylde (1909): 89.
[43] Baring-Gould and Bamfylde (1909): 436.
[44] Treacher (1890): 69.

Brooke's administration also led to the growth of Kuching. In 1848, it was a small place with a few Chinese and Indian shops, and not over 1,000 Malays in the outskirts. There was little trade, few native *prahus* and the jungle hemmed in the houses. The Chinese gardeners and farms had not yet made any impression on the place. With the growth of confidence and establishment of peaceful conditions, the town grew and by 1865 its population was no less than 15,000. [45]

From these humble beginnings, Kuching has steadily grown to become the capital and chief port of Sarawak. Its early start and fortunate choice as the town and port of Brooke's Sarawak Proper, its position as the port of entry of Chinese immigrants, and its initial Malay population have all helped to maintain Kuching's position as the largest town in British Borneo.

Sibu, the second town and port of Sarawak, had a much later start, being founded by Chinese immigrants only in the first decade of this century. Despite its recent foundation, it is fast becoming an important rival of Kuching. Being the port of entry for Foochow immigrants during the first few decades of the twentieth century, it is now largely a Foochow Chinese town and is also the focus of the Lower Rajang area.

During the same period when Sarawak was expanding and economic progress was being made, Brunei, on the other hand, was languishing and on the decline. In 1847, of the once flourishing town, only 12,000 remained and the Chinese population had almost disappeared. Docks capable of berthing vessels of 500-600 tons were still to be seen in Hunt's time but have long disappeared. [46] Baring-Gould and Bambylde record in 1909 that "on the picturesque hills that surrounded the town are still to be found traces of thriving plantations which formerly existed there, and which extended for many miles into the interior. These have totally disappeared with the population which cultivated them." [47] Today, only the little that remains of Kota Batu [48] stands as a reminder of its glorious days gone by.

Right up to the turn of the century there was, therefore, very little in the nature of economic development in both Sarawak and Brunei. Brunei, though independent, was in a state of bankruptcy and decay. The Brookes on the other hand, had spent most of this time in suppressing headhunting and piracy and in establishing law and order. During the 50 years of Brooke rule, there was no introduction of economic schemes comparable to the North Borneo railway project, nor did the Brookes attract large scale investment into the country.

[45] St. John (1863): 309.
[46] Hunt (1847): 5.
[47] Baring-Gould and Bamfylde (1909): 44.
[48] Harrisson (1956): 283-319.

The White Rajahs were more interested in attracting peasant agriculturists rather than big investors. This early policy is reflected today in the absence of large plantations and other large scale organisations and also in the presence of large numbers of immigrant agriculturists in the country.

Although there was immigration during these years, it was the coming of rubber in the first decade of the twentieth century and the discovery of oil in Miri in 1910 that were to draw in the immigrants who have done much to change the landscapes in the Kuching, Sibu and Miri districts. In Brunei, it was also the discovery of oil at Seria in 1929 that revived the country and which has been responsible for the changes that are still going on.

ECONOMIC DEVELOPMENT: NORTH BORNEO

Despite the coming of the Chartered Company and the return of peaceful conditions, population was still small, numbering less than 100,000.[49] In order to attract capital and settlers into the new country, very favourable immigration terms were offered. Active steps were taken to secure Chinese immigration to supply labour, and large numbers of Chinese began to pour in both from China and Singapore. This immigration measure was not successful and many returned. Nevertheles, communities were established at Kudat and Sandakan, the two ports of entry for the Chinese which still thrive today.

Kudat was newly discovered in 1881 and was made the first capital. High hopes were entertained for Kudat, since in its strategic position it was hoped it would not only attract the coastal trade of both flanks of Borneo but would also act as a stopping place for boats sailing between Europe and China. These hopes, reminiscent of Balambangan and Labuan fifty years before, did not materialise. A small town grew there, and was, and still is, a sleepy hollow.

In 1883, the capital was, therefore, moved to bustling Sandakan which had been founded by Pryer in 1879.[50] The original village had been accidentally burnt down, and Pryer moved down to the harbour entrance and founded Elopura, Sandakan's early name. It became and remained the chief town of the territory until after the Second World War when Jesselton became the seat of administration. But today, Sandakan is still the principal trading centre. Its excellent harbour and the commercial potentialities of the East suggest that Sandakan will remain the commercial capital for a long time to come.

The energetic way in which Pryer tackled the piracy problem and the enthusiasm he put into his town soon brought in both Chinese

[49] *North Borneo Census Report (1891).*
[50] Tregonning (1954 B): 35-50.

and natives and also revived a considerable trade in jungle produce, timber and birds' nests. While the west coast was still busily engaged in acquiring land from the independent chieftains, the Company concentrated on the northeast coast with its trade centred at Sandakan, and later on tobacco which gave another boost to the area. It must, however, be emphasised that Sandakan, like many of the other major port towns of today such as Lahad Datu, Semporna and Tawau are largely the creations of the Company and not indigenous villages taken over by them.

In the west, it was thought that the building of a railway would help open the country and railway construction was therefore launched in 1896. It was to prove a costly failure at the beginning, bringing the Company to the verge of bankruptcy, although it did bring in Chinese labour which formed the nucleus of the population of railway towns later on. The line from Beaufort to Weston, both settlements created by the railway, was completed in 1900. The port of Weston was found to be inadequate and it was proposed that the line should extend to Papar Grantisan and then to Gaya Bay and finally to Jesselton, also the creation of the railway. But the railway did not produce dramatic results since there was not a staple, like tin in Malaya, to haul. Not until the coming of rubber was there an influx of people and capital into the west coast, for by chance the railway was to traverse lands suitable for padi and rubber, a feature which was to save the country and to shift the focus to the west. This culminated in the transference of the capital to Jesselton after the War.

GENERAL ECONOMIC POSITION

Within British Borneo some forms of economic integration hold the three political units together. Basically alike in their dependence on primary production and brought together in a larger currency union, the territories also share elements of their transport and labour economies, and engage in much inter-territorial trade. Although it does not produce a significant share in Southeast Asia's output of any commodity, except pepper and oil, British Borneo occupies a place in the larger economy of the region in that it produces the same primary commodities for world markets. It appears that with the exception of oil refining, the British Bornean economy will for some time continue to rely on the production of raw materials.

Nevertheless, economic factors have been of prime importance in their effect on the settlement landscape of the country. In the first place, the distribution and density of population over the country is affected by the pattern of economic activities. Thus the Kuching area, the Sibu area, the Miri-Seria area, the west coast plains of North Borneo and the Sandakan area support a denser population than do the interior and eastern parts of the country which have not been

fully penetrated and opened up for development. Within these densely populated areas, padi areas have higher densities than the rubber estate areas, and Chinese smallholding areas have higher densities than areas of shifting cultivation. Secondly, the ethnic groups show, in their distribution, some instances of correspondence with areas of specialised economic activities. Sago areas are worked by Melanaus; padi areas are peopled mainly by indigenes; gold-mining and rubber small-holding areas by Chinese; coconut areas by Chinese and Bajaus; fishing areas by Malays and Bajaus. Thirdly, the concentration of different economic activities in different areas has given rise to different settlement types in each of these areas: thus there are rubber estate settlements and the ports of North Borneo, the padi settlements on the northwest coastal plains, the Melanau sago settlements along the Third Division coastal areas, the gold-mining towns of Bau in the upper Sarawak river area, and the recent oil towns of Miri, Lutong, Kuala Belait and Seria.

For most parts of the country, rubber has introduced a three-fold pattern of land use: (1) imported commercial plantations; (2) imported Chinese rubber smallholdings; and (3) indigenous subsistence padi farms. This three-fold pattern has not altered much since rubber was first introduced except in places where Chinese have started growing other crops instead of rubber. Elsewhere, these three major elements exist side by side, often integrated into a blend of all three systems.

The simplicity and multiplicity of the pattern of land use is, however, dependent on the extent to which the area has been penetrated by commercial crops and by Chinese, by roads, railways and other capital enterprises. The above more densely settled areas, situated in the plains between the coastal swamps and the interior hills, are places with better transport lines and with more Chinese and agricultural development. In each of these areas, the land use shows a blend of all systems, whereas the interior and other less accessible regions show a simpler type of land use.

In areas with new land use patterns, new settlement patterns have also appeared at the same time. Although plantation and commercial enterprises have introduced new settlement forms, the largest contribution by a single people to settlement change has come from the Chinese. Wherever they have gone, their settlements and smallholdings and towns have appeared on the scene. Often they form the vanguard of pioneering forces within the country, and many Chinese homesteads are adjacent to settlements of shifting cultivators. But the greatest change to the landscape made by the Chinese is still in the coastal plain area between the swamps and the interior hills.

The large-scale immigration of Chinese did not begin until the development of commercial crops and the discovery of minerals. Large numbers of Chinese moved across the border from Dutch

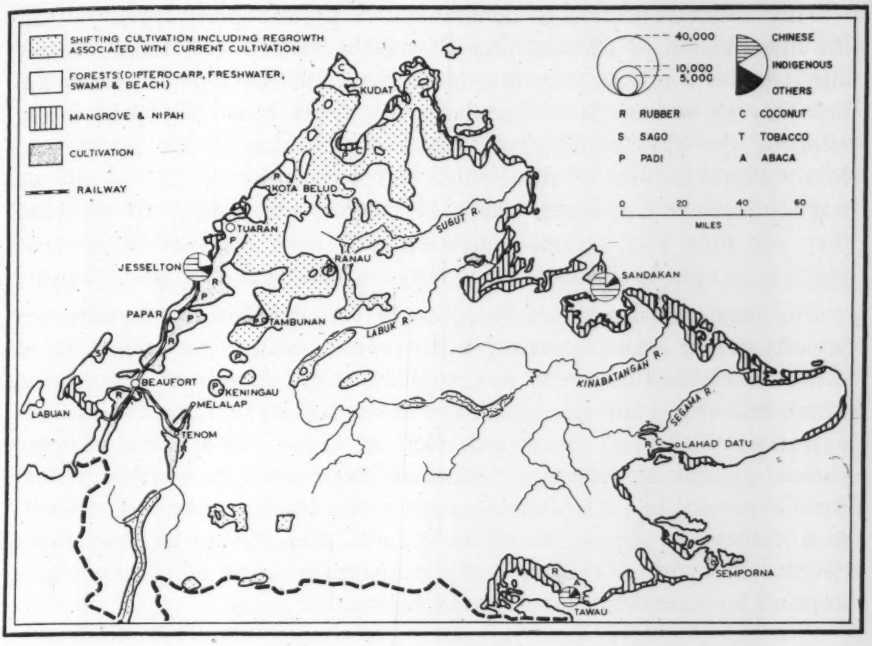

Fig. 2. Land Use and Settlement in North Borneo.

Borneo into the Bau area to mine gold during the early days of Brooke rule; many of the miners turned agriculturists later. Large numbers were also pouring in by sea into Kuching and others moved into Sibu later to plant padi, pepper and, later, rubber. In North Borneo, there was a movement of Chinese into Kudat and Sandakan and also along the railway line into the interior. Today most of these areas form the nuclei of large Chinese settlements.

The coming of oil, although relatively recent, has had a great impact on the economy and the landscape. The tangible evidence of this impact is seen largely in the coastal strip of oilfields where towns like Miri, Lutong, Kuala Belait and Seria have appeared. Oil, like gold in Bau, has also drawn in immigrant labour from overseas, and the normal patterns of the population in these areas have been upset. It has also drawn out to the coastal oilfields Malay peasants from Brunei kampongs and Dayaks from their interior long-houses. Most important of all is the fact that the revenue from oil makes it possible for Brunei to finance its development plan. New roads, new settlement schemes, new ports, new airfields, new padi fields are appearing on the Brunei scene and form part of the fast changing landscape. It is envisaged that with all this money available for social and economic development, Brunei will fast outstrip Sarawak and North Borneo in achieving better standards of living and will also have, within a shorter time, more radical changes in her primitive landscape.

Thus the introduction of commercial crops, the discovery of oil and the immigration of Chinese into Borneo has introduced many changes and it is also true that economic and agricultural development during the last fifty to seventy years has been the single most important factor affecting the growth, distribution and composition of the population. Many characteristics of the British Bornean settlement today may be traced back to the development of rubber, the railway or oilfields; they are thus very recent, appearing only after the establishment of peace and order in the area by the Brookes and the Chartered Company.

The economic history of the country can therefore be divided into periods during which certain products were profitable; during each of these one economic activity was emphasised in one area of the country, which therefore saw an expansion of settlement in that area to the exclusion of the rest. In British Borneo, there was the early mining period centred at the upper Sarawak river area, the rubber period, the oil period, and each of these cycles has had a geography as well as a history. As seen in the different landscapes in various parts of the country today, it is evident that each crop or commodity has left its imprint, however faint, on a specific region.

POLITICAL GEOGRAPHY

Although British Borneo has been in the backwater of international politics the above survey does bring out the fact that it has had its vicissitudes in political development and these have changed its political complexion and pattern completely from what it was in the sixteenth century. Looking back over its recent political geography, it should be noticed that only the Portuguese and Dutch navigators were the first people to look upon Borneo as a unit. It was the Portuguese who extended the name Borneo (Brunei) to the whole island. To them it was a landmass to be circumnavigated, a coastline to be charted. It was only at this period and in this sense that Borneo was a single country.

Although Borneo is at present divided into four political territories, the coasts of Borneo, before the advent of the Europeans, had for long belonged to other island kingdoms of Southeast Asia. This was because within this island world of Malaysia the seas have united rather than divided and the real frontiers have always been the mountainous centres of the islands, not their coasts. Banjermassin in the south of Borneo, for example, is racially a part of Java; the east coast, Samarinda, Balikpapan and even as far north as Tawau, is a Bugis country racially and economically part of Celebes. In Lahad Datu Sandakan and Kudat one hears the speech of Filipino Moros and the native chiefs still hold their titles from the Sultan of Sulu. In the west — Brunei, Kuching, Sambas and Pontianak — is the Malay culture of Johore and Sumatra which has felt the impact of European

and Chinese colonising elements most. In the far interior is what the Dutch administrators finely called Great Dayak, an impenetrable centre which was ignored until the twentieth century. Even in North Borneo, the union of the east coast and west coast into one political territory is a marriage of two different worlds. Nevertheless, there are political pressures today that belittle such past political fragmentation and associations and foreshadow a future unity for the whole of Borneo.

In the recent past, there have been three pressures on Borneo. These have been, first, the Indian population; secondly, the Chinese population; and, thirdly, as a result of these pressures and the impact of the west, the slowly crystallising units of Southeast Asia. In the future, it appears that there will be two main pressures on Borneo: the same age-old movement of people from the Asian mainland; and — a recent phenomenon arising from Indonesian independence — Pan-Indonesianism, which in the last resort will, no doubt, be backed politically and militarily by Australia. These two pressures will, of course, be influenced by two main elements in the Bornean landscape today: the island's oil, as at Seria, Miri, Balikpapan and Taranakan, and its sparse population (12 per square miles as against 850 per square mile in Java and 250 in China). It has already been suggested that "oil and empty spaces, and the pressure of Chinese and Javanese millions are the factors which mainly determine the future. The first will attract the eyes of ambitious industrial powers, particularly those of Asia, who have no oil of their own. The second will provide the plausible excuse that excessive populations must expand into undeveloped areas. Under these influences it may well be that the Chinese and the Javanese will make of Borneo a political issue. [51]

Politically fragmented in the past into the different coastal sultanates and their spheres of influence, today the island is still fragmented into four political units of Sarawak (British Colony), Brunei (British Protected Sultanate), North Borneo (British Colony) and Kalimantan (Indonesian Borneo). Set within an area of emergent nationalism and newly independent states, Borneo (particularly British Borneo) is a political anachronism now as it was also before the War when part of the country was ruled by a White Rajah and a part by a Chartered Company.

It has already been pointed out that Borneo is in the centre of the area in the spatial sense but paradoxically it is not the core area in the human sense, and has had a lesser share of the civilizing contacts and other influences that have come into the region. Just as its geographical position has explained the diversity and backwardness of its tribes so has it partly explained the backwardness of its political evolution.

[51] *The British Survey* (1951): 3.

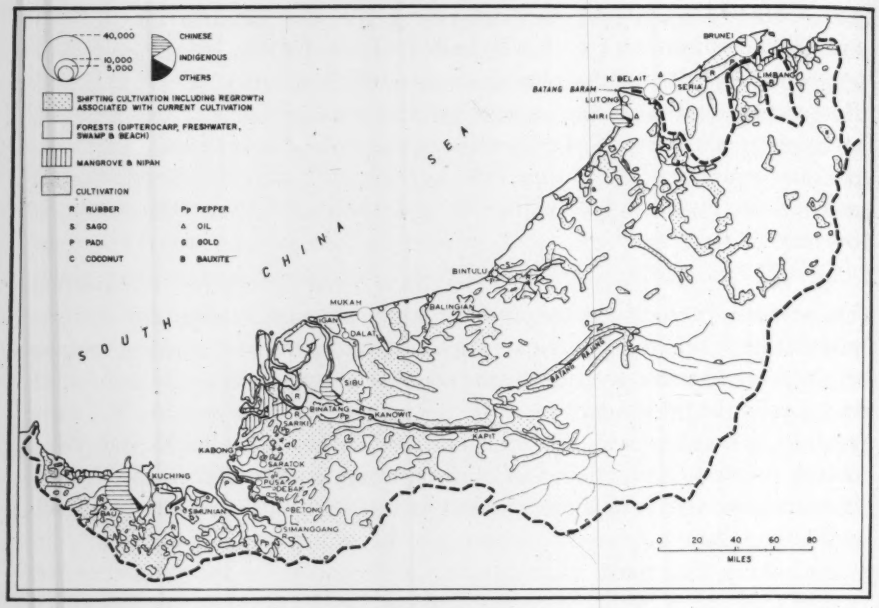

Fig. 3. Land Use and Settlement in Sarawak.

It is still a land without a nation. And there is no such person as a Bornean.

Even plans for a loose federation of the three British territories have made no headway and are virtually dead for some years to come. Although a federation of British Borneo would allow for greater national diversity than would a unitary state, the Brunei Malays who jealously guard their oil wealth and fear Chinese influence in the other two territories, do not want it; and the indigenous people of the other two territories, nervous also least changes give more power to the Chinese, have also given it no active support. But commercially, apart from Brunei's wealth through oil, North Borneo and Sarawak have a promising future. Borneo is being steadily developed on the east coast, close to that great silent part of Borneo Island which is Indonesian. British Government funds and Chinese private enterprise and capital are important factors in this development. The dilemma is that if there is to be commercial development, then in Sarawak and North Borneo at least, Chinese help cannot be refused. It emphasises the fact that alien minorities form not only racial but also economic obstacles to political integration. On the Indonesian side internal problems have kept the Indonesians busy, but the time will soon come when they will begin pressing for a merger of all territories into a Greater Kalimantan just as vigorously as they are doing now over West Irian.

It is clear that British Borneo is fast coming into the international limelight not only because of oil and settlement potentialities, but also because of the changing political status of the countries around her. The recent independence of Malaya and the advent of Singapore as a self-governing state have had repercussions in British Borneo, changing political patterns and also influencing British strategic interests in the area. Such influences are reflected in the fact that North Borneo is now openly to be used as a military touch-down point between Singapore and Hong Kong; that military manoeuvres will take place there in place of Malaya; and that Labuan has been declared a free port and is being developed as an international airport. Just as the early nineteenth century activities of the British in this area epitomised the strategic and trading interests of her China Sea trade, the transfer to Borneo today epitomises changing political patterns and strategic interests as well as a withdrawal of British influence into one of the last bastions of her Asian colonial empire.

It is possible to distinguish four phases in the history of settlement in British Borneo up to the Second World War. Beginning from the Balambangan debacle to the coming of Brooke in 1839 and the occupation of Labuan, the first phase epitomises the early trading and strategic interests of Britain in her South China Sea trade.

The second phase saw intensive efforts by Brooke with aid from the British Navy to wipe out piracy and headhunting. These efforts to suppress piracy led to the territorial expansion of Sarawak, so that by 1868 on the death of James Brooke, Sarawak had extended as far north as Kidurong Point. This was not a period of drastic settlement changes as the Government was mainly pre-occupied with establishing peace and order. Only in the Upper Sarawak River were there changes on the forested landscape,[52] changes which were made by the large influx of Chinese from Dutch Borneo.

With the succession of Charles Brooke, Sarawak entered upon a new period of progressive development and expansion. Piracy was eradicated and although there was some development and immigration, the important feature was the annexation of the rest of the present Sarawak territory from Brunei. In North Borneo, on the other hand, the Chartered Company on the granting of the Charter, began with the gradual annexation of land from the many independent rulers on the west coast, followed by a period of railway building and the creation of towns. This phase also saw the focus on the northeast coast at Sandakan, becoming more so with the rush to plant tobacco in the last two decades of the nineteenth century. This was also not an active settlement phase in North Borneo, the Company being concerned more

[52] St. John (1863): 345-46; 369; Baring-Gould and Bamfylde (1909): 185-86.

with the establishment of ordered government, railway building, trade and importation of a transient labour force both for the tobacco estates and the railway.

It was only the last phase, beginning at the turn of the century, with rubber, and later oil, as an incentive that saw a flood of immigrant labour and settlers coming into the country. Thus this phase saw the intensification and extension of settlement in British Borneo, an extension which involved a movement not so much of indigenous agricultural people, but of both immigrant labourers and peasants mainly from China. Most of them moved into the Kuching, Sibu, Miri, Seria, the west coast of North Borneo, Kudat, Sandakan and other pockets on the east coast, to open up land not only for rubber but also for other crops. The Chinese and native groups in British Borneo show often similar patterns of distribution and economic function; this is very different to Malaya where the native Malays and the various immigrant communities contrast sharply in their distribution and in the role they play in the country's economy. Major changes in the peopling and settlement pattern of British Borneo occurred only in this last phase. These developments were interrupted by the Second World War, but during the last years they have resulted in major modifications of the traditional coastal Malay and interior long-house settlement patterns. During earlier periods,the changes which affected the rest of the South east Asian world touched Borneo only marginally; in the words of Harrisson the area "has received the last gasp of the ideologies of the West, the final faint ripples. Hindu influences just reached as far as the Philippines, visibly petering out even in North Borneo, Arab influences and Mohammedanism again just about reached their limit there, and failed to influence a large majority of the population directly. European influences followed much the same pattern." [53]

In fact, British Borneo is one of the last places in the world to be brought under "control" and it is only since the Second World War that modern methods of "colonial" government have been applied to the country — the last accretion to the British Empire.

[53] Harrisson (1949): 103.

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The Originality of Japanese "Capitalistic" Society

Notes on the proportions of Proprietors, Employees and Family Workers

KOJI IIZUKA

VERY small-scale agriculture (farm units average 1.7 acres per household) is not the only occupation carried on with the support of unpaid family labour. Table 1 indicates that Japanese industry also has an extraordinarily high proportion of very small units. The facts that in Japan's case medium- and small-scale enterprise in manufacturing industry is forced to adopt the form of subcontracting, and that the differential in wage levels between large and small enterprises is remarkably wide, have become recognised over the last few years and hardly need detailed exposition here.

TABLE 1

Distribution of Factories, Occupied Population and Output by Scale of Industry (1956)

Factory Size (No. of persons engaged)	Plants		Persons Engaged		Value of Output	
	Number	%	Number (thousand)	%	Value (hundred billion)	%
— 3	237,807	54.9	541	8.9	2,180	2.5
4 — 9	84,624	19.5	548	9.1	3,635	4.2
10 — 19	59,495	13.7	801	13.2	6,736	7.7
20 — 29	20,579	4.7	489	8.1	4,860	5.6
30 — 49	14,810	3.4	558	9.2	6,241	7.2
50 — 99	9,152	2.1	620	10.3	8,179	9.4
100 — 199	3,739	0.9	515	8.5	8,323	9.6
200 — 299	1,237	0.3	300	5.0	6,165	7.1
300 — 499	901	0.2	342	5.6	7,980	9.2
500 — 999	590	0.1	409	6.8	9,696	11.1
1000	439	0.1	925	15.3	22,924	26.4
Total	433,373	100.0	6,048	100.0	86,919	100.0

Source: Ministry of Commerce and Industry, *Industrial Statistics.*

The American periodical *United States News and World Report* for 20th April 1959 carried an article under the impressive title of "The Miracle of Japan—From Ashes to Riches in 14 Years".

Professor Koji Iizuka is Director of the Institute of Oriental Culture at the University of Tokyo.

> The recovery of Germany from a defeated nation to a world power is the sensation of Europe, but look at what happened in Japan! That old enemy too has staged a sensational comeback. Industry has far outstripped the prewar level of production and still continues to rise.[1]

This was demonstrated by an easily understood chart of comparative indices of major items before the war, at the end of the war and for the latest year.

Within Japan itself it seems to be generally publicised that we now suffer under the General Council of Trade Unions, as though the trade unions were the big trouble since the war. It was therefore a revelation to discover that this American financial journal sees the situation in a completely opposite light. According to its account, the Japanese do not demand excessive wage rises but work hard for long hours. It states that they are endowed with perseverance and industry and are quick to assimilate the latest complicated techniques. Compared either with other industrial countries or with undeveloped countries it sees them as the kind of workers you dream about. The article concluded on the note that, because of this, Japan was the best country in the world from the point of view of capital. However, it did not fail to mention at the same time the widening gap between big and small business; the vast difference in wage levels between the two; the gloomy outlook for the population who cannot find employment even at the lower level and the increasing contradictions beneath the "miracle's" brilliant exterior.

Some years ago, shortly before Pearl Harbour, I was told by a student of a certain university that his teacher of economics had taught him that if he wanted to understand the nature of Japanese capitalist economy all he need do was to read *Das Kapital* and someone or other's *Historical Materialism*. Seeing that the student seemed to be impressed that that was all there was to scholarship, I was for a while at a loss for what to say. This was no doubt because at the time I myself was taking a long look at the way modern Japan had, since the Meiji Restoration, been outstretching herself in "making the country prosperous and strengthening the Armed Forces" and "increasing production and encouraging industry" with the aim of joining the ranks of the Great Powers at the earliest possible moment, and was then facing the life-and-death test of modern total war, with politics, economy, ideology and everything else coloured by militarism. On reflection, it seemed to me that neither classical economics nor leftist formulism could explain the peculiar structure of Japanese capitalism.

[1] From this report I discovered that we are paying 40 million dollars a year for the importation of foreign technique and for patent fees, 80 per cent of it to America, and that on the other hand we are earning $500,000 from exports of technical assistance.

THE INDIVIDUALITY OF JAPANESE CAPITALISM

Capitalist countries, as far as they are capitalist, have certain general and common features; but they also show certain peculiar features in their social structure. It is certainly a common feature that the capitalist class, the owners of means of production, the entrepreneur class, do not like socialism or communism. It is also certain that, compared to pre-war days, there has been a great step forward in that, scared by bitter experience of the great depression of 1929-30, they have become very sensitive to business fluctuations and take precautions against them seriously. Both "capitalism" or "socialism" are, however, no more than generic terms, like "horses" or "cows". What exist in practice in this world are not just "horses" in general but racing thoroughbreds, powerful draft Percherons, surefooted mountain ponies or Shetland ponies for children to play with. Not only do their abilities and uses differ, but they also require different care and training. In the same way, what we call "capitalist society" includes the cases of England, America, Japan or Australia, which differ, naturally enough, in their conditions of economic development.

TABLE 2

International Comparisons of Wage Differentials by Scale in Manufacturing Industry

Factory Size (No. of persons engaged)	Japan (1952) Annual Wages of all Workers Y 1000	Differentials	United Kingdom (1949) Annual Wages of all Workers £	Differentials	U.S.A. (1947) Annual Wages of all Workers $	Differentials
1 — 4	—	—	—	—	2,018	65.2
5 — 9	74	39.2	—	—	2,049	72.8
10 — 19	86	45.5	—	—	2,340	78.7
10 — 24	—	—	303	83.9	—	—
20 — 49	99	52.5	—	—	2,607	84.4
25 — 49	—	—	301	83.4	—	—
50 — 99	114	60.4	302	83.7	2,643	85.6
100 — 199	131	69.3	306	84.8	—	—
100 — 249	—	—	—	—	2,663	86.2
200 — 499	158	83.3	310	85.9	—	—
250 — 499	—	—	—	—	2,717	88.2
500 — 999	182	96.4	324	89.3	2,792	90.3
1000 —	189	100.0	361	100.0	3,088	100.0
Average	126		324		2,777	

Sources: Japanese Government, *Economic White Paper for 1954*, Tokyo, p. 191. For Japan, Ministry of Commerce and Industry, *Industrial Statistics for 1952*, For U.K. and U.S.A., the relevant industrial Census.

Tables 2 and 3 set out some of the basic data for Japan and other capitalist countries, and illustrate clearly the ways in which Japan differs from other leading capitalist countries. Table 2 shows what nonsense it is, particularly in the case of Japan, to make international comparisons of wages simply in terms of averages.

As a result of the high rate of modernisation and investment over the past few years, the record of the rise in Japan's labour productivity has been outstanding. Despite a considerable rise in wages (in average value) the labour cost required to produce one unit of product has, in contrast to the more advanced countries, actually fallen.[2] Figure

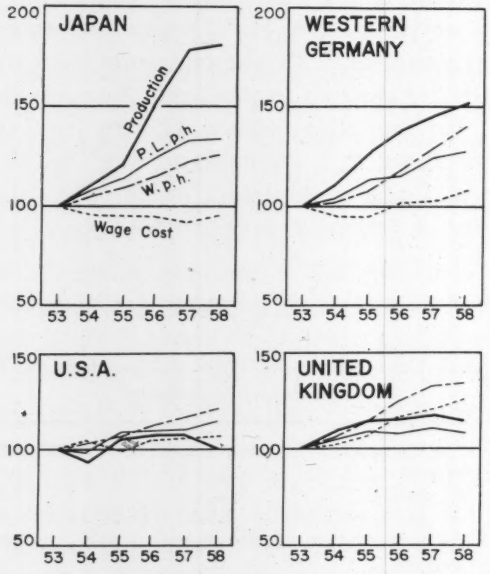

Fig. 1. Contrasts in Production, Productivity of Labour per hour, Wages per hour and Wage Costs in Japan and Selected Western Countries.

1 shows just how great this contrast is. In both England and the United States the curve of wage per hour shows a steeper rise than the curve for index of production or labour productivity per hour, and even in Western Germany the share of wages in production cost has tended to rise since 1956. Japan is the only country which has actually been able to reduce wage costs. Thus, setting Japanese wage levels in their international context, we can agree objectively with the special correspondent of the *United States News and World Report* when he says that Japanese workers do not demand "excessive" wage rises and praises the quality of the labour force. During this period, however, the wage differential between big and small business, far from decreasing, has actually shown a continuing tendency to widen, and temporary and

[2] Japanese Government: *Economic White Paper for 1959*, Tokyo, p. 36.

outside workers in big business have been left out of the wage increases received by regular workers. Furthermore, the widespread use of temporary and outside workers would seem to be particularly and charcteristically Japanese.

Table 3 is, I think, the international comparison which shows most strikingly the peculiarity of Japan as a capitalist society. In my experience so far as a teacher and writer, I have found the peculiarity of Japanese society represented by those figures to be the most difficult to get across to people.

TABLE 3

Employment Status of Economically Active Population
An International Comparison

Percentage Classified as	Japan 1954	France 1946	W. Germany 1950	Switzerland 1941	Sweden 1950	Australia 1947	U.S.A. 1950	U.K. 1951
Proprietors	25.9	34.7	14.8	21.4	19.4	19.5	16.1	7.2
Employees	37.2	65.3	70.8	70.9	76.7	79.6	81.8	92.6
Family Workers	36.9	—	14.4	7.7	3.9	0.9	2.1	0.2

Notes: For details see Prime Minister's Department, Statistical Bureau, *Digest of International Statistics* (in Japanese). Family workers correspond to "Unpaid Family Workers" in the I.L.O. Yearbook. In the case of France, wives of proprietors assisting their husbands in their work are included as "proprietors" and other family workers are included as "employees".

When all the Japanese who are economically active are classified by their employment status it is seen that the proportions of proprietors, employees and unpaid family workers are respectively 25.9 per cent, 37.2 per cent and 36.9 per cent. The total of the proprietor class and the family labour associated with it accounts for over 60 per cent of the working population. The corresponding figure for England is no more than 7.4 per cent. In Australia the figure is 20.4 per cent or, in other words, wage labour and salaried employees make up 79.6 per cent—a sharp contrast with Japan's 37.2 per cent.

The above figures are the proportions of the total working population in agriculture, forestry, fisheries, mining, construction, commerce, transport, communications and other public enterprises, service industries and Government service. Turning to the population engaged in manufacturing industry only, in England (1951), of a total 8,445,000, 191,000 were of proprietor status, 8,121,000 were employees and some 2,000 odd were family workers.[3] On this basis, those of proprietor status

[3] Japanese Government: *Digest of International Statistics,* Tokyo. As they stand the three figures add to 130,000 less than the total and the percentages are therefore a little odd; the percentages are worked out on the figures as they stand.

are just over 2 per cent, employees just over 96 per cent and family labour is practically negligible. In contrast, in Japan (1953) of the total of 6,740,000 engaged in manufacturing industry, proprietors were 960,000 (just under 15 per cent), employees 4,870,000 (just over 72 per cent) and family workers 910,000 (just under 14 per cent). Japan is a highly developed capitalist country and is often envied for her industrial development; she nevertheless diverges sharply from the classical pattern of Western capitalist society as represented by England.

SOME POLITICAL IMPLICATIONS

Even supposing the workers in all industrial sectors, including agriculture and commerce, could be unionised, they would only amount to 37 per cent of the economically active population in Japan's case. Proprietors and their family workers, who in Japan make up almost two-thirds of the economically active population, exist as a hotbed of *petit bourgeois* and small proprietor mentality. Small though they are, they are lords of their own establishments, and they with their families cannot feel sympathy with the belief that the strike is a weapon for the preservation of workers' livelihood. Besides, when they feel desperate, as for example in a depression, their despair no doubt takes a form befitting *petit bourgeois,* small proprietors.[4]

What, we may ask, is the significance, in elections for example, of the large numbers of proprietors, big or small, in the Japanese type of capitalist society?[5] I would like the above tables to be considered carefully with this in mind.

Dismissal of employees and the impoverishment and collapse of small proprietors are typical examples of the way in which the effects of recession are thrust on to the weakest groups. In a recession, even though it may not amount to a depression, poverty attacks through the dog-eat-dog set-up of the capitalist economy. Unlike the employee or working class, however, the members of the small proprietor—small producer class are each individually, albeit in a small way, masters in their own right and as such are in the position of mutual competitors in the open market. When business is bad those in the same trade compete even more keenly, paring their margins to the bone in the struggle for existence. For that reason there is no class whose energy is more difficult to organise for their own defence, and as they lack power to

[4] In our own time we have seen how in Germany, hit by the pre-war depression, Fascism arose. In the process leading up to Hitler's seizure of power, the frustrations of the *petite bourgeoisie* were calculatedly and fully made use of by the Nazi demagogues.

[5] The problem is analysed more fully in my article which appeared in *Chuo Koron* (Tokyo) for March 1957 under the paradoxical title of "Capitalists Who Failed to Make the Grade as Wage Earners" (subtitle, "The wretched position of proprietors of small and minute business").

bring pressure to bear on the Government, they tend to look for a remedy for their despair in the emergence of some hero.

I do not want to give too pessimistic an impression about my own country. Here I would like to leave aside for the moment the formal argument which says that the position of very small proprietors or producers, including farmers, *vis-à-vis* monopoly capital is essentially no different from that of the working class. I would like to chew over the self-evident principle that small proprietors, however small, are after all proprietors and not members of the proletariat. The above is but a summary of what is a large and complex topic; nevertheless, it does, I think, offer a point of view which is of some value in explaining the idiosyncrasies of Japanese politics.

POSTCRIPT

This article is a somewhat rephrased translation of Part 4, Chapter 8, of my *Japan in Asia* (Asia no naka no Nippon), published in June 1960, by Chuo-Koron-sha, Tokyo. During the course of the year 1960, the wage differential between large and small business in Japan has shown, thanks to the economic growth of very recent years and for the first time since the war, a slight amelioration; that is to say, it has stopped increasing and instead has more or less decreased. Examination of Fig. 1 shows that even in Japan the share of wages in production costs has tended to increase since 1957.

Research Notes and Comment

The Editorial Board hopes to develop a section devoted to Research Notes and Comment. Contributors are invited to outline briefly the research work they have in hand, relating it either to a more general research topic or to a wider field of geographical and social studies, and perhaps indicating the initial results of their research. Too frequently we feel geographical research is kept unpublished until it is considered to be worthy of a major paper. However commendable this may be it reduces discussion among geographers to a minimum and hinders the fruitful exchange of ideas. Even more conspicuous is the absence of comment amongst geographers upon published papers. We hope therefore to receive brief comments upon the concepts, theses or viewpoints presented by our contributors.

CHANGE IN THE NEW ZEALAND VILLAGE: THE VILLAGES OF SOUTHERN NORTHLAND 1950–60

These villages were first studied by the author a decade ago, and were described in an unpublished Master of Arts thesis,[1] so that this report is something of a postscript to the earlier study. Twenty-eight villages were selected for the original study, extending from the tiny railway settlement of Taipuha in the extreme north of Otamatea County to Swanson in the south, a village at that time steadily being engulfed in the spread of Auckland Metropolitan area.

While there are some exceptions, the villages of southern Northland are typically coastal or riverine, and the visitor in 1950 could usually find a wharf or jetty nearby, a forlorn and decaying reminder of the long dependence upon coastal shipping and river transport. In form and pattern they are almost without exception linear, even the larger centres being without the rudimentary grid pattern more typical in the Wellington area. Furthermore, there is often extreme fragmentation of settlement with farm and village settlement intermingled. Their form and layout serve as crude symbols of their haphazard and spasmodic growth. There remains abundant evidence from the past of the competing functional attraction of river landing and dairy factory, main road and railway, occurring in an economic and institutional milieu which provided neither guidance nor control. In most cases the efficiency of the settlement as a servicing centre has suffered: in Maungaturoto, for example, the visit of a local farmer to the centre might involve him, in the course of normal business, in a journey from the dairy factory with its offices and large general store, to the railway and saleyards some three miles away. On his way there he would possibly call at the bank or post office, garage or stock and station agent, in the main business centre, which itself extends for almost a mile along the main highway. Yet Maungaturoto in 1950 had only 132 non-farm-houses and a population of about 400 people.

In function the villages are similar to those in other areas of New Zealand, for they provide for the more immediate social and material needs of the farming community and of the village itself. In one important respect, however, the

[1] Anderson, A. Grant, *The Rural Villages of Waitemata, Rodney and Otamatea Counties: A Study in the Geography of Rural Settlement.* Unpublished M.A. Thesis, University of New Zealand, Auckland, 1952.

settlement net of this area differs from that in most farming areas of New Zealand. Apart from Warkworth and Helensville, whose range of services is only slightly greater than that of the larger villages, there are no larger incorporated settlements south of Dargaville and Whangarei, so that the hierarchical grading of marketing centres that one finds in more closely-settled areas is missing, and the village in this area is undoubtedly more vital in the whole fabric of marketing and social relationships than is the village in most rural areas of New Zealand.

The main forces which have shaped the village historically, and especially the impact of changes in the period 1920 to 1950 which were so profound that they affected the whole original analysis, deserve brief mention. Consolidation of farming had continued during this period, particularly on to drained swampland in the vicinity of Ruawai, and, in the late thirties and early forties, on to areas of gumland about Wellsford and Kaiwaka. At the same time the growth of road transport, the consequent decline and extinction of regular coastal shipping, and the increasingly restricted role of the railway which had been built through the area early this century brought about a drastic modification in the relationships that had evolved. Some villages like Mangawhai, whose river landings were no longer used, bypassed by the main road settled quietly into untidy obscurity; others such as Wellsford or Maungaturoto, lying astride road junctions and stimulated by business people with drive and confidence, began in the late thirties to expand in response to new demands and forged ahead of the others. Meanwhile in all villages one could discern the effect of social, economic and technological changes which were apparent in rural life; in the disappearance of the village tradesman, in the establishment of motor garages and motor transport depots, and in a general narrowing of the range of social functions. No longer was the local community able to provide sufficient support for the Agricultural and Pastoral show, the New Year sports or the axemen's carnival and these gradually died out except in the larger centres.

In view of the continuation of these trends, and in view of the general stability in numbers of farming population in the area, the writer felt justified in predicting, pessimistically, in 1950 a rather circumscribed future for the villages. Apart from the three larger centres, Wellsford, Maungaturoto and Ruawai, where continued growth could be anticipated, it seemed likely that the rest would make little progress and would continue to provide no more than the basic needs of the community.

While the immediate and superficial impression gained in revisiting the villages was that the prediction had proved accurate, nevertheless a closer analysis reveals that at least some of the pessimism was unfounded and that some of the centres have displayed a vigour which seemed impossible ten years ago. The most impressive change has taken place in the three largest villages. Their continued growth in an atmosphere of increasing business confidence is steadily transforming them from their "village" status. The most striking index of this growth is in the addition of new housing, for there has been an overall increase in the three centres of 64 per cent since 1950, whilst Wellsford has increased 92 per cent. This growth of population has been matched by an increase in the number and range of services. Retail services have shown increasing specialisation and the new enterprises include six clothing, three footwear shops, and four dealing in a range of household hardware, electrical appliances and other bric-à-brac which is a conventional symbol of prosperity. There are new establishments supplying foodstuffs, and new tea and refreshment rooms, but most interesting has been the establishment of fruit and vegetable shops in each of the centres. Continued specialisation in farming is apparently rendering the farming community less and less self-sufficient so that our concept of "basic" services must change accordingly. The increasing mechanisation of farming at the same time has stimulated a

marked expansion of general and motor engineering and 11 new establishments have been added in these three centres.

Whilst the expansion of retail services has led in Ruawai and Maungaturoto to some consolidation of the business centre, there is no similar trend in the growth of housing which continues to follow earlier patterns of uncontrolled ribbon development along main highway and side road alike. There has apparently been no attempt to encourage the formation of subsidiary roading which would make the settlement more compact, and without exception new housing has sprung up in pocketed fashion along existing frontages. The short-term economies of this may benefit the individual, but the community as a whole will inherit the long-term problems of providing in the future normal urban amenities of water supply, sewerage, footpaths and paved roads, and of rationalising land use and traffic circulation within the centre.

In contrast to the vigour found in these centres, the small villages such as Pakiri, Punoi, and others with a very minimum of functions, appear unchanged by the ten years, and those which have made any progress are exceptional. Leigh, in Rodney County, has made the greatest progress, and besides additional housing, the erection of a new hotel and new hall to replace buildings destroyed by fire reflects confidence in the future of the centre. Two factors contribute to this: the continued development of beach settlement in the vicinity, and the establishment of a small fishing enterprise supported by local fishermen, producing smoked and deep-frozen fish at a small plant in the village and retailing throughout the district. In Te Hana, north of Wellsford, there have been 12 new houses and a motor garage added. This centre is a more specialised dairy factory settlement, and the new housing is being provided for the growing labour force.

The broader and more diverse group classed as medium or secondary villages in 1950 have experienced a greater variety of trends. A number which are not sited on main roads, Matakana and Kaukapakapa being examples, reveal almost no change in form except for the addition of one or more new homes. On the other hand there are a few which have displayed surprising vitality. Until 1920 Paparoa was the unquestioned centre of the county, with County Offices, the Magistrate's Court, the bank, and the Cottage Hospital as well as a range of other services. During the period from 1920 to 1950 it had been effectively supplanted by Maungaturoto, which had the dairy factory and the railway, and it seemed doubtful whether it would recover any of its former status. Yet its housing has grown from 27 to 41 non-farm-houses while a public hotel, a drapery shop, chemist, and stock and station agency have been established, and a new hall and school built. Kaiwaka, on the main road south of Maungaturoto, was being affected by land development in its vicinity, and its continued expansion could be anticipated in 1950.

Four villages in Waitemata County, Riverhead, Kumeu-Huapai, Albany and Silverdale, whilst still serving a rural community, are being affected increasingly by the nearby dormitory and beach settlement, so that their additional services, the appearance of multi-unit blocks of shops, and the increasing specialisation of the services, are not solely the result of increasing demand from the rural community. In Riverhead and Kumeu-Huapai there has been considerable expansion of housing, some of it dormitory settlement, as well as intensification of farming. In the case of Albany and Silverdale there has been little change in housing within the village and little sign of intensified land use, but nearby ribbon development and expanding beach settlement are affecting these two centres.

It is apparent that although the majority of villages have displayed little growth, there have been changes of an economic and social nature which could not be anticipated in 1950, and these developments underlie the renewed vigour found in some centres. Ten years ago there had been little opportunity for these centres

to recover from the impact of depression and war, building restrictions and land sales control, while the tide of centralisation had lowered business confidence in the smaller centres. Franklin[2] has suggested that the more rapid growth of some villages has been strongly influenced by the character of the business community, and the pattern of change in the last ten years supports this, for it largely explains the appearance of multi-unit blocks of shops in the centre of a number of villages, and the changed atmosphere of Paparoa.

Since 1950 there has been an increase of 52 per cent in village housing, and although a proportion of this is dormitory settlement taking place near Auckland, nevertheless it is safe to assume that non-farm population is growing more rapidly than farm population. Undoubtedly this is a part of the general expansion of tertiary activities in our national life, and reflects more specifically the growing specialisation of farming, its increasing mechanisation and the continued prosperity of the rural community. Almost all the activities which have been added to the village economy, for instance, have been of the servicing type, the only new processing or manufacturing industries being a small engineering firm in Wellsford and the fishery in Leigh. Joinery shops have been set up in four centres, reflecting the expansion of building activity, while 20 new motor garages have been established. At the same time three small industries have been closed: a small knitwear factory at Riverhead, and a saddlery and limeworks at Wellsford. The growth of retail services has been accompanied by increasing specialisation: of 71 new enterprises, 16 are drapery shops and 15 are hardware firms, whilst in the villages on the main highway there have been nine new refreshment and tea rooms.

There was little opportunity for more than a superficial enquiry about changes in the social functions but there seems little doubt that the transformation of rural life brought about by a variety of forces is continuing, and the demands made upon the village are changing accordingly. That they are still regarded as vital centres for social intercourse is indicated by the fact that ten new community halls have been built, all but two of them being in large centres. Without exception these are War Memorial halls built with Government subsidy, or are Returned Servicemen's halls. In the centres which have one, the licensed hotel remains a powerful magnet, while in the five villages that also have a Totalisator Agency Board one can expect a Saturday stir which would be a mystery to an overseas observer. However there is a range of other "social" functions centred on the village, less spectacular yet perhaps more enduring, which continues to weld a district and locality into a self conscious community.

A. GRANT ANDERSON

[2] Franklin, S. H., "The Village and the Bush", *Pacific Viewpoint*, I, 2, Sept. 1960.

The Asian and Pacific Scene

NEW GUINEA: A POSTSCRIPT

It was stressed in *Pacific Viewpoint* (Volume I, Number 2, 1960, pp. 242-44) that economic development in Dutch New Guinea was a necessary adjunct to political development. Since that date such wide-sweeping political reforms have occurred that economic development becomes even more urgent.

The Dutch have established the independence of the Papuans as their principal task in New Guinea. In order to prevent chaos when they retire the Dutch have started training a national political cadre capable of legislating for an independent Western New Guinea. They have formed a Council of 16 elected members and 12 appointed members which "will have full co-legislative powers from its very beginning". Furthermore, "within one year of its institution the Dutch Government intends to ask the Council for advice regarding the way in which the right of self-determination for the Papuans can be best obtained". (Covering note of the Government to the First Chamber of the Netherlands Parliament on the final reading of the New Guinea Council Bill, announced in the Bulletin sent to the Royal Netherlands Legation in New Zealand, 3 November, 1960.)

The Australians also acknowledge that "the end of political advancement is self-government" (*Australian Policy in Papua and New Guinea,* published statement made to the House of Representatives, Canberra, Tuesday, 23 August 1960, by the Hon. Paul Hasluck, M.P., Minister for Territories, p. 13). But the Australians "are not going out of the Territory in a hurry" (p. 15, "Territory" refers to both the United Nations Trust Territory of New Guinea and Papua). Thus political advancement is based primarily on a policy of "uniform development", and "when in The Hague, Mr. Hasluck specifically dissociated himself from the Dutch view of rapid development through the forcing of elites" ("Prospects for New Guinea", *Current Affairs Bulletin,* Vol. 26, No. 9, 5 September 1960, pp. 131-32). Taking local government councils as a basis the aim is to build slowly towards national government. For the present, Papuan representation on the Legislative Council is to be limited. The Legislative Council which opened on 10 April 1961 included 37 members: six elected and six appointed native members, six elected and four appointed non-native members, and 14 official members with the Administrator acting as President (p. 29, *Progress of a People,* prepared under the authority of the Minister for Territories on the occasion of the opening of the Legislative Council for Papua and New Guinea on 10 April 1961).

Many aspects of this policy have been criticised by a number of well qualified writers (e.g., "New Guinea", *Outlook,* 5 October 1960, pp. 7-14; and articles by Murray Groves, *Observer,* Sydney, 26 November and 24 December 1960). Major criticisms are the time required for the operation of such a policy, particularly in the face of probable demands for independence; the possibility that disunity rather than unity may be the outcome of basing political development on local than regional government; the lack of training or opportunity at present for Papuans at the national level of government and administration, thereby frustrating the urbanised elites; and the fact that already development is far from uniform.

Mr Menzies has stated, when referring to the granting of independence: If in doubt you should go sooner, not later" (Press Interview, 20 June 1960, quoted in *Papua and New Guinea: Some Recent Statements of Policy on Political Ad-*

vancement, issued under the authority of the Minister of Territories, p. 13). Thus Mr Hasluck has the support of his Prime Minister. Moreover the more qualified critics of his policy comment on the methods and timing of political advancement, not on the aims. However, opposition to the granting of independence has come from white settlers in New Guinea. In order to answer this vociferous group Mr Hasluck has constantly referred to "partnership" and has stressed that minority interests will be guarded.

Australia has an unenviable task and it is to the credit of Mr Hasluck and his colleagues that they are prepared to face this problem. But in the light of the methods by which the Dutch are facing a similar task one must question the validity of the methods to be employed by Australia in overcoming such huge obstacles. The pressure of white settlers, the refusal to admit that recent events in Africa and Asia have any similarity to the situation in Papua and New Guinea (*Australian Policy in Papua and New Guinea,* p. 9), and the attempts to mask the influence of Dutch reforms on Australian policy (*Papua and New Guinea,* p. 6), are further complications in an already complex and potentially explosive situation.

IAN POOL

SOLOMON ISLANDS: LAND TENURE AND ECONOMIC DEVELOPMENT

The popular view of the Solomon Islands is of an underpopulated group infrequently visited by overseas cargo vessels and economically held to ransom by a monoculture based upon the coconut palm. Whilst this view is unfortunately correct, it fails to recognise the development that has taken place throughout the Protectorate during the past ten years. To a large extent this progress is the outcome of information obtained from surveys undertaken either by individuals at the request of the High Commissioner or by administrative officers withdrawn from normal duties. Beginning with Walker's investigation of forest resources in 1948, there have been surveys of mineral deposits, fisheries resources, and prospects of growing cacao (F. S. Walker, *Report of the Forests of the British Solomon Islands Protectorate,* London, 1948; J. C. Grover *et al, The Solomon Islands—Geological Exploration and Research, 1953-56,* Geological Survey Memoir No. 2, London, 1958; H. van Pel, *A Survey of Fisheries Resources in the British Solomon Islands Protectorate,* South Pacific Commission, Noumea, 1956; D. H. Urqhart, *The Prospects of Growing Cacao in the British Solomon Islands,* Bournville, 1951). This growing awareness of the group's importance to both Melanesia and the Southwest Pacific as a whole, was given official expression in 1952 when the High Commissionership for the Western Pacific was granted independent status and made separate from the Governorship of Fiji.

The most recent report published—an investigation of customary land tenure —is also the most comprehensive work available to date on the Solomon Islands (C. H. Allan, *Customary Land Tenure in the British Solomon Islands Protectorate,* Report of the Special Lands Commission, Honiara, 1957). Throughout the Protectorate, land falls into one of three categories—native, private and public. Native land is that owned by Solomon Islanders or held by them under customary tenure; private land is held by non-natives in freehold, and was purchased before the Land Regulation of 1914 prohibited further alienation; and public land is any which does not come within the first two categories. Since the acquisition of freehold land is now restricted to the Crown only a fraction (6.1 per cent in December 1958) is not held under customary tenure by Solomon Islanders.

Even though land is the Solomons' most important resource nine-tenths of the total area lies above 2,000 feet and is clad in dense rain forest. In these areas the land is the undisputed possession of the Solomon Islanders and their plots are to be found clustered on the less steep hillsides, in the narrow valley floors, and on the few small plateaus. In contrast, about one-fifth of the narrow and more fertile coastal strip was alienated before 1914, and almost all of this could be classified as "first class coastal land" (p.60). Some of the smaller islands, such as Russell which is given over almost entirely to European-owned plantations, are also those in which the soils are sufficiently fertile to withstand the heavy and continued demands of the coconut.

A considerable number of islanders live in the villages and grow coconuts for copra, part of the receipts from which are used to pay for communal duties not fulfilled as a result of their participation in a cash economy. Because the sub-clan is the effective land-holding group, such people have no title to the land on which the coconut groves are situated. Conversely, the European plantation owner is provided with some security of tenure by legislation, even though this does not extend to the recognition of a guaranteed title. Thus has customary land tenure, which "appears to have been fluid when Europeans arrived, adapted itself haphazardly to new social, political and economic needs". In the face of these gradually accelerating changes the recurrent theme throughout Allan's report is that the traditional system of tenure "should not be allowed to evolve without direction or purpose, that problems relating to it cannot be left to Local Government, that tendencies towards individual tenure should be encouraged, and that where conditions are ripe, adjudication and registration should proceed on the basis of the issue of individual titles. While natural resources should be preserved, they must also be developed to economic advantage" (p. 303).

Land is so plentiful throughout the Protectorate that it is under- rather than over-used. It will be many years before population pressure has reached the stage where, as on the outlying Reef Islands and Tikopia, man-land ratios are more than 200 persons per square mile. Yet even though the Solomons is underpopulated coastward migration and "urban drift" is as much a problem here as in the more densely settled parts of the Southwest Pacific. Since 1945, what might be termed the "urban' population has trebled. This has led to apprehension about the lack of land set aside for native housing, particularly in the main centre Honiara, which has grown from a collection of temporary huts to a town of 3,500 in the 15 years since it was established. Allan estimates that approximately 1,000 Solomon Islanders are living in the capital (p. 125), but in the three years since his report was written, this number has been increased by the in-migration of a further 1,830 (*Pacific Islands Monthly*, Vol. XXX, No. 7, Sydney, February 1960, p. 140).

If the problem simply consisted of the Islanders' need to lease a portion of public land for residential purposes, its solution would be comparatively straightforward. It is complicated, however, by the attitude of the European population, the bulk of whom are engaged in administrative duties and who rarely remain in the territory for more than four years. To them town life is seen to be the prerogative of the European, and only because of "unfortunate necessity" do they suffer the presence of Melanesians and Polynesians in Honiara at all.

Those employed by the Government and various public corporations live in housing estates specifically provided for them, but other workers are less fortunately placed. For these latter, "housing is consistently short, overcrowding is widespread, services are limited, (and) furnishing is negligible" (Allan, p. 125). Shanties have sprung up in the short space of 15 years, for the number legitimately employed is swelled by those who come in search of work, superior

education, or expert medical treatment, or who are lured by the glamour of "urban" life. Even though a smaller number is involved, the position in Honiara is depressingly similar to that at Port Moresby, where 15,000 Papuans live mainly in improvised shanties of old timber and rusty corrugated iron (M. C. Groves, "How We Exploit the Papuans", *Observer,* Vol. 3, No. 26, Sydney, 24 December 1960, p. 9).

Frequently, as a result, the Solomon Islander is placed in an invidious position. Though often desirous of acquiring a lease and becoming a permanent resident he is discouraged by restrictive building regulations and the lack of public amenities. He may have doubts at being labelled a temporary resident when he outstays most of the "permanent" European population, but he is certain to be highly critical of a Central Government which does not abide by the housing regulations it enforces. Dwellings for married Fijians have been constructed by the administration from non-permanent materials which the Solomon Islander is forbidden to use.

Allan quite rightly is sympathetic towards the Islander who migrates to Honiara, Gizo or Auki, the most important of the four district centres. He argues strongly against the view that non-Europeans constitute a transient group who, sooner or later, will return to the village, and recommends that in Honiara long-term leases be granted to encourage and facilitate their permanent settlement. With this achieved, Allan looks forward to the day when the Solomon Islander will assist in the administration of town affairs.

Whilst these recommendations reflect bold thinking it is not certain that any of Allan's suggestions on this question have been taken up, despite a recent report which stated that "the necessary legislation arising from it [i.e. *Report on Customary Land Tenure . . .*] has been drafted and enacted" ("Social Science Research in the Pacific Islands", *South Pacific Commission Technical Paper,* No. 127, Noumea, September 1959, p.1). It is to the administration's credit that a further committee was appointed in April 1958 to consider "the housing of Solomon Islanders in Honiara" (*British Solomon Islands: Report for the Years 1957 and 1958,* London, 1960, p. 40). Whatever the outcome of this second investigation, the attitude of the European minority will have far-reaching consequences, for the "ill effects of the cinema, drinking, prostitution, bad health and vagrancy" (Allan, p. 127) which today constitute a problem in Honiara may be equally evident tomorrow in the secondary centres of Gizo and Auki.

Coastward migration and "urban" drift, however, are not the only forms of population movement that urgently demand the clarification of tenurial concepts. Planned, extra-territorial migrations to the Solomons began in 1955 when an advance party of about 30 Gilbertese was transferred from Sydney Island, in the Phoenix group, to Titiana, on Gizo Island. By September 1958 two further groups were settled, and today the community approaches 430. Village allotments averaging half an acre now occupy the foreshore at Titiana, houses have been built, and small plots of sweet potato, paw paw, cassava, banana and sugar cane have been planted. Nearby, the coconut plantation of Nusabaruku has been subdivided on the basis of ten palms per family, whilst to the rear of the village an area of generally hilly land has been made available for larger gardens. Forced by circumstances to be intensely land conscious, the Gilbertese have obtained spectacular yields from food crops by following methods of intensive cultivation that are foreign to most Solomon Islanders.

Nor is this the first re-settlement scheme in which these unfortunate people have participated. In 1937, 700 Gilbertese were moved from overcrowded areas in the Southern Gilberts to the atolls of Hull, Sydney and Gardner. Less than 20 years later on Sydney Island (the least successful of the planned settlements) land suitable for taro pits and coconut palms was so scarce that yet another shift

was necessary, this time to Gizo Island (B. Hilder, "More Gilbertese Move Out—To Become New Solomon Islanders", *Pacific Islands Monthly*, Vol. XXIX, No. 4, Sydney, November 1958, pp. 57-61).

Although the Solomon's population pressure is at present confined to a handful of outlying parts, population growth and present agricultural techniques are such that within the next two generations land hunger could develop on Santa Ana, Sikaiana, Wolande and Fanilei ,and in parts of Malaita—at Nonosila and Kwi, around the Lau lagoon, and on the islands of the Langa Langa lagoon. In the very near future, crowding on Tikopia and the Reef Islands is likely to become so acute that controlled emigration will be desirable. When this should take place, how many of the local people should be involved, and to what extent it should fit into an overall programme for the Solomons as a whole can hardly be answered when there are no accurate forecasts of "population trends related to land and food resources in terms of land tenure and agriculture techniques" (p. 242).

While such local needs must be met within the framework of an overall scheme for economic development, the major challenge before the Protectorate arises not out of population pressure but out of the need for a more efficient use of the area already under cultivation—a course previously hampered by the Land Regulation of 1914 which gave no individual security of tenure. Since the draft Land and Titles Regulation meets this requirement, it is not too much to hope for an increased volume and greater variety of agricultural produce to bolster the inadequate revenue at present derived from the sale of copra, trochus shell, and kauri logs. Partly as a consequence of this situation, the British Exchequer each year makes a grant-in-aid to the Solomons, and the contribution for 1961 will amount to £570,000, or half the Protectorate's budget (*Pacific Islands Monthly*, Vol. XXXI, No. 7, Sydney, February, 1961, p. 21). Too little of this sum is channelled into capital developments, for almost all of it represents a subsidy on existing services. The amended land legislation is, in fact, a challenge to the Solomon Islands, since, as Allan correctly observes, it emphasises that "land consciousness, at present misdirected and wasteful of resources, can be put to productive economic use within the framework of present and future social and political development" (p. 304).

MURRAY CHAPMAN

THE CHALLENGE OF THE MAORI POPULATION

As Borrie has already demonstrated, the Maori population represents a microcosm of some of the population trends to be found in many areas of the world (W. D. Borrie, "The Maori Population", *Anthropology in the South Seas*, J. D. Freeman and W. R. Geddes (eds.), New Plymouth 1959). The so-called "population explosion" is not a phenomenon which one usually associates with New Zealand, yet the Maori exhibits the characteristics which are regarded as being typical of an emergent population. In the majority of New Zealand statistics the implications of the Maori population dynamics are not apparent because the Maori constitutes a minority group within a considerably larger, more highly developed and demographically more stable society. It is doubtful if New Zealand administrators fully appreciate the probable influence of present Maori population trends on the future development of the country as a whole, although there is evidence of increasing concern for the welfare of the Maori people themselves.

The 1956 *Population Census* ("Maori Population and Dwellings", *Population Census 1956*, Vol. VIII, Government Printer, Wellington, 1960) provides the most recent description of the Maori population. In 1956 there were 137,151 persons in New Zealand with half or more Maori "blood" and, therefore, con-

sidered to be Maori for census purposes. In addition there were 25,307 persons with less than half Maori "blood" who were classified as non-Maori although such a classification may not be an accurate description of their cultural identification. In the intercensal period, 1951 to 1956, the Maori population increased by 18.6 per cent, or an average annual increase of 3.5 per cent. As the Maori gains arise exclusively from natural increase the annual figure is best compared with the non-Maori natural increase for the same period of 1.6 per cent. A major contributing cause to the comparatively high rate of Maori increase is the decrease in Maori infant mortality. Although there have been some major fluctuations the rate has fallen from 153.26 per 1,000 live births in 1938 to 68.16 in 1951 and 54.36 in 1956. The non-Maori rates, 19.39 in 1956, suggest that there is still considerable room for improvement. A Health Department survey indicates that with improved Maori housing and an intensified ante-natal and post-natal care programme the rate should continue to fall ("Survey of Maori Households in Relation to Infant Mortality", *Medical Statistics of New Zealand for the year 1956,* Government Printer, Wellington, 1959).

As a result of improved Maori infant mortality rates and mortality rates in general, which fell from 16 per 1,000 in 1946 to 9.37 in 1956, the age structure of the Maori population differs markedly from that of the non-Maori. Compared with the non-Maori the Maori population is very youthful: the median age of Maori males is 16.32 and females 16.28 compared with the non-Maori medians of 29.08 and 30.36; 19.15 per cent of the Maori population is under the age of five and 47.01 per cent under 15, while for the non-Maori the comparative figures are 11.31 per cent and 30.41 per cent. Only 3.63 per cent of the Maori are over 60, but 13.25 per cent of the non-Maori. It is impossible to obtain national figures for completed family size but the above statistics suggest that the Maori family must be considerably larger than the non-Maori. In the "Survey of Maori Households . . ." already quoted, the eight Maori mothers over 40 years of age in a randomly selected sample had produced an average of 12.25 children of whom 2.12 had died and the comparative figures for the eight non-Maori mothers from a similar sample in the same age group were 4.62 and .13.

The general implications of such an age structure are reasonably clear. At present Maori parents have the problem of feeding, clothing and housing families which are disproportionately large in comparison with the European families. The New Zealand educational system must make provision for Maori pupils whose numbers are increasing at an unprecedented rate. In the near future New Zealand's economy will be expected to absorb a larger number of Maori employees than ever before and the social services will also be expected to meet the needs of an increasing number of Maori clients. A rapid increase in population obviously presents some problems in the functioning of any society, but a closer examination of some of the information available concerning the Maori suggests that the difficulties in New Zealand are not merely a matter of numbers.

The Maori is still predominantly a rural dweller, 76.23 per cent of the Maori population live in counties and in the intercensal period the proportion in cities and boroughs has increased by only 4.93 per cent. Nor are the Maori evenly distributed throughout New Zealand, the North Island contains 96.17 per cent of the Maori population (Auckland Province 72.45 per cent) while in six counties the Maori outnumber the non-Maori. The relationship between employment opportunities and the distribution of the Maori population is clearly demonstrated by the Department of Labour in two maps comparing these factors and the evidence amply justifies the conclusion that "the largest aggregations of Maori population are in areas far removed from centres of economic activity" ("The Maori Population and Employment", *Labour and Employment Gazette,* X, 4, Department of Labour, Wellington, 1960). Unless considerable develop-

ment occurs in the rural areas, it seems reasonable to predict a marked increase in Maori population movement in the next decade. Indeed the article suggests that "the flow of Maori migrants will have to be in the vicinity of 4,000 a year" into the cities and boroughs. The comparison of this estimated number with the intercensal migration rate of approximately 1 per cent, or 1,370 per year would lend support to the view that there are resistances among the Maori themselves to urbanisation. This view is further strengthened by the statement that "in country areas there is already some underemployment among adult Maoris".

That the Maori has less variety of skills for sale on the labour market is demonstrated in census returns which show that in 1956 the Maori were poorly represented in the professions and skilled occupations and that 21.2 per cent of the Maori male labour force were classified simply as "Labourers" compared with 7.9 per cent of the non-Maori. Absence of employment in skilled trades is reflected in differences in income between the Maori and the non-Maori. The 1956 census volume states that "the returns show 59 per cent of the Maori and 83 per cent of the non-Maori male population receives £500 a year or over. The groups earning more than £700 cover more than half, 56 per cent, of the non-Maori labour force compared with less than a quarter, 24 per cent, of the Maori labour force". Although 30.67 per cent of Maori males are engaged in agriculture, forestry and related work (compared with 19.14 per cent non-Maori) and agriculture is noted in New Zealand for the relatively high income it provides, the following statement from the census volume indicates the uneconomic nature of many Maori farms: "The proportion of Maoris earning £500 a year or over in the division covering agriculture is the second lowest of all the industry divisions, even though this group contains the highest proportion of employers and workers on their own account". Unless educational resources are sufficient to increase the number of Maoris trained for the professional and skilled occupations there is a strong possibility in the future of the Maori becoming identified solely with the low paid and unskilled urban labouring class, with the consequent fusion of class and race prejudices.

Taking into account family size and income it is not surprising that some Maori parents in rural areas state that they find it economically difficult to ensure that all their children will obtain adequate higher education. The problem of Maori education cannot be stated simply in terms of limitation of finance and resources in serving a rapidly increasing school population. Press reports of submissions made to the Commission on Education in New Zealand, which is now in its second year of hearing evidence, would seem to suggest that teachers of experience in Maori schools are not satisfied that the present curriculum, designed predominantly for non-Maoris, is altogether appropriate to meet the needs of Maori children. A survey of research over the last five years (John E. Watson, "Studies in Maori Schooling", *Education*, 9, 4, Department of Education, Wellington, 1960) would seem to indicate that Maori children experience difficulty in subjects which test their English vocabulary or which require an adequate understanding of written English for success. Watson points out that in several of the studies "speculations on the effects of bilingualism are offered freely" while in others personality factors arising from cultural differences between Maori and non-Maori are stressed.

It is obvious that the educational services for Maori children are being challenged and will be further challenged by the rapidly increasing youthful population, but what is not so evident is the demand which will be made on other social services as the present generation of dependent children move into the adult age groups. The position with regard to the health services, for instance, has only recently been made clear. R. J. Rose states, "There has been a misconception common among physicians and health workers that the Maori is comparatively free from these (degenerative) types of disease", and goes on to

point out that the misconception arose because workers in the health field had ignored the different age structure of the Maori and non-Maori populations (R. J. Rose, *Maori-European Standards of Health*, Special Report Series 1, Medical Statistics Branch, Department of Health, Wellington, 1960). By the use of age specific rates to adjust crude death rates Rose presents a very different picture of Maori health from that which had previously been current. The effect of this adjustment is best illustrated by reference to the death rate for 1958, which was 8.9 for the non-Maori and 8.7 for the Maori. The Maori adjusted rate is 17. The application of this technique to each of the major causes of death and, with some technical limitations, to figures for hospitalisation leads Rose to conclude that, "In addition to the group of epidemic and infectious diseases as well as all the acute types of respiratory and gastro-intestinal diseases, the Maori is much more susceptible than the European to death from one of the so-called degenerative conditions such as cancer, diabetes, cerebral vascular lesions, heart disease and chronic forms of nephritis... Accidental deaths and homicidal deaths are much more frequent among Maoris of both sexes". Taking into account his findings with regard to specific cause of death and the additional fact that "there appears to be a disproportionate number of Maori admissions to public hospital for treatment" his final conclusion is that if the Maori standards of health continue to be substantially lower than the non-Maori, "hospital and medical services would need to be expanded at an increasing rate to meet the increase in numbers seeking medical treatment".

Although cross-cultural comparisons are particularly unreliable in the field of mental health because of differing cultural toleration of the mentally ill, the application of age specific rates to first admissions to mental hospital demonstrates the Maori rates are lower than the non-Maori with the exception of the 10 to 29 age group (*Mental Health Statistics of New Zealand for the Year 1959*, Medical Statistics Branch Health Department, Wellington, 1960). The disproportionate number in this age group is accounted for by a higher incidence of schizophrenia and mental deficiency. The complete absence of Maori first admissions for non-psychotic alcoholism and the small number of psychoneurotic cases may also indicate a different pattern of mental disorders in the Maori when compared with the non-Maori.

The rapid increase of the Maori and the consequent age structure of the population has given rise to problems, such as Maori housing, which have been evident for some time; other problems, for instance the true incidence of disease in the Maori, have only recently been identified, but the full social implications of the growing proportions of Maori to non-Maori has not yet been made apparent. In 1956 there were 14.9 non-Maori to each Maori, the lowest the ratio has been since 1891; by 1972 the figure may have fallen to 11.6 non-Maoris to each Maori; by 2,000 it may be nearer 6. If the nature of race relations in a country is in some way a reflection of the population proportions of the ethnic groups involved, one may wonder if inter-group tensions in New Zealand will mount as the proportion of Maori to non-Maori increases.

J. R. McCREARY

Geographical Reviews

LEAP FORWARD FROM THE LEFT BANK

J. Guillermaz, *La Chine Populaire,* Presses Universitaires de France, Paris, 1959.
P. Huard et M. Wong, *Chine d'Hier et d'Aujourd'hui,* Horizons de France, Paris, 1960.
Cahiers Franco-Chinois, Quarterly, Paris.
A. de Riencourt, *L'Âme de la Chine,* Arthème Fayard, Paris, 1960.
E. Calic, *La Chine, grande puissance,* André Bonne, Paris, 1960.
J. Jacquet Francillon, *Chine à huis-clos,* Presses de la Cité, Paris, 1960.
R. Dumas, *J'ai vu vivre la Chine,* Arthéme Fayard, Paris, 1960.
E. Servan-Schreiber, *Chine Rouge, vint-cinq ans après,* Plon, Paris, 1960.
Tibor Mende, *La Chine et son ombre,* Editions du Seuil, Paris, 1960.

What are we to think of present-day China? An unknown land, a world isolated by the "Bamboo Curtain", a gigantic concentration camp or an earthly Paradise? French travellers, more numerous every year, make their way across China: novelists, journalists, economists or simply tourists, alone or in delegations invited by the Government of China. Almost all feel the need to narrate their experiences, to describe their impressions, whether favourable or unfavourable, so that today anyone, even without having been to China, can form an opinion about it.

Some works are simply enquiries. Such is *La Chine Populaire* by J. Guillermaz which traces the country's historical evolution and paints a picture of its institutions, society, and economic life, and of the role which the "Overseas Chinese" play both in supplying the country with currency and in spreading the influence of People's China in the countries of Southeast Asia and the Pacific. It is a handy book in which information and figures abound and which, in spite of a few lapses, shows a laudable care for impartiality; it will soon need to be brought up to date for events move fast. . . .

Another work of enquiry is the fine book by P. Huard and Ming Wong: *Chine d'Hier et d'Adjourd'hui.* "China", the authors say, "is famous rather than well known", so they undertake a thorough study in all the scientific and technical fields: language and literature, ideas, science and technology, fine arts, finally the characteristics of its civilisation. The China of today is lightly sketched, but the authors' aim is above all to show what are the deep roots of present-day China, and the innumerable diagrams and maps, the engravings and etchings, the scenes from town and country, give a very vivid picture of life in China and make this magnificent work a mine of precious documents.

The *Cahiers Franco-Chinois* have on several occasions collected together the testimony of travellers. The October 1959 number, published on the occasion of the tenth anniversary of the People's Republic of China, extracts from the reports, previously published in various French newspapers, of a delegation of economists, MM. Bettelheim, Bartoli, Denis, Dumontier, Pressat; in these they tackle problems of birth and death rates, increase of population, contraceptive propaganda, methods of economic planning, questions of irrigation, of the agricultural "Leap Forward" and of small rural industries. These reports, written by specialists, are of the greatest interest but, since they are two years old, they are today outdated. The June 1960 number contains a collection of important extracts from articles published by three journalists in their respective newspapers (M. Fatras, of *Havre Libre,* M. Rivière of *Progress du Lyon* and M. Carasso of *Marseillaise*). They tackle a certain number of problems which seem "burning" to Europeans, such as "Buddhism and Christianity" or the future of small craftsmen, or again the "yellow peril", but they also furnish precise and detailed information, particularly on the annual per capita income of one "commune", an income which has doubled in ten years.

Another journalist, Emile Servan-Schreiber, gives more recent evidence. He returned to China 25 years after a first journey there, whence his title *Chine Rouge, Vingt-cinq ans après.* He tries to judge objectively the results of a revolution "which the increase and impoverishment of the population made inevitable . . . and which counts as one of the most important historical events of all time." Certainly he is not a complacent admirer. He notes in passing the errors committed, sometimes corrected. He scoffs gently at the new "austerity", the little room left for originality. But he draws a vigorous distinction between the seriousness, the integrity, the joy in their work and the well-being of the Chinese and the misery and squalor which exist in Hong Kong and which contrast vividly with the luxury and pleasures of a few. The progress achieved in two years, thanks to the "Great Leap Forward", is undeniable and, he says, necessitates a long period of peace in China; this being so, the non-recognition of China by the Western powers seems to him an absurdity. The comparison he makes between the Chinese revolution and the Soviet revolution, at least in its beginnings, is entirely to the honour of the former. "China . . . owing to a certain moderation, a less brutal break with the past . . . retains a certain structure and quality, an appearance which is its own".

M. Amaury de Riencourt in *L'Âme de la Chine,* tries to make this past understood. In order to prove that history is only a perpetual "beginning again", he strives to show how Chinese civilisation underwent cyclical crises. After the "slump" caused by "contact" with the West, China, under the impetus of Marxism, returns to its first vocation: "It is a more modern, more effective, more pitiless version of what was for thousands of years the 'Celestial Empire' . . . " He quotes the example of Emperor Wu-Fi (B.C. 140) who adopted measures to control prices, created State monopolies and undertook gigantic operations, to conclude: "This attempt at planned economy turned into tragedy!"

M. Edouard Calic's conclusions in *La Chine, grande puissance,* are more optimistic. His book is a report, very complete and full of precise information on the development of agriculture and industry, on the way in which this people, for centuries struggling with famine, drought and flood, has conquered these scourges. The figures surpass imagination and he recites from one of his conversations the question "Can you compare our task with that of the Pharaohs? Beside us they were only petty artisans. . . . The effort of 650 million Chinese is man's revenge on the gods!"

The works of J. Jacquet Francillon and R. Dumas are also reports. Both are essentially "travel notes". If the first is openly hostile, one can however find in it indications that would leave those who knew the China of 30 years ago dreaming: "The children are bursting with health . . . the crowd is always properly dressed . . . China, that overpopulated nation, needs more manpower. . . ." The second, also anecdotal, is more sympathetic to New China. The author goes from surprise to surprise: the constant refusal of any tip amazes him particularly, but he sees in this not so much a care for dignity as the application of a directive. If the "commune" seems to him the end of any private life, he nonetheless states its results honestly: "China, which has known so many miseries and famines . . . has found in the co-operative the solution of its agricultural misfortunes. . . . The Chinese people are gay and happy".

Revolution or evolution? Return to the past under a new form? It seems that many authors have asked themselves that question. M. Tibor Mende, the author of the most important of the works we have discussed, *La Chine et son ombre,*[1] turns resolutely towards the future and tries to understand in this perspective the

[1] Tibor Mende, "China and Her Shadow", Thames and Hudson, London 1961, pp. 360. Index, map.

"unique" undertaking which is the Chinese revolution. Knowing many other underdeveloped countries, in particular India, he is in a position to make interesting comparisons. But he is not content with superficial impressions: travelling more than 25,000 kilometres (15,600 miles) he visited like everyone else, but better than everyone else, towns, factories, co-operatives, even prisons. He tries, beyond the economic factors, to discover the motivating element and finds it in what he describes as an "idealism", a "Messianic impulse" which has for its first objective the transformation of man himself. Certainly, this does not take place without "a real suffering", accepted most of the time, but it is thanks to this transforming of man (not to his enslaving) that progress in agriculture, industrialisation, the rise of culture have been able to be accomplished. Tibor Mende traces the stages of the evolution of China from 1949 onwards, "the Hundred Flowers", "the Leap Forward", relations with the U.S.S.R. In the recent past, as in the future, he sees "bursts of enthusiasm and tears of suffering". But, he says, "it would be fair (to the Chinese) that their discipline, their know-how, their devotion, their heroism should be recognised, their sacrifices admired and their progress recorded. . . . One day the true China will surely have to appear. Neither terrifying nor angelic—simply human."

J. DRESCH

TAKE OFF AT KAI TAK

Eduard Szczepanik, *The Economic Growth of Hong Kong,* Oxford University Press for the Royal Institute of International Affairs, London, 1958, pp. xiv, 186, Index and map, 25s. Foreword by F. Benham.

Post-war Hong Kong has experienced an industrial revolution so rapid that its economy, once based upon the entrepôt trade with China, has been transformed. The Colony lacks many of the advantages usually considered necessary for industrial development—she has few raw materials, no power resources; there is a serious lack of land and of water; there is no protective tariff barrier; and the Colony has had to bear the strain of great population pressures. A study of the mechanism of the economic growth has therefore an added dynamism. And yet Mr Szczepanik's interpretation lacks substance.

The framework of the book is an unhappy one, and although its purpose is "to describe and analyse the economic growth of Hong Kong during the decade which followed the Second World War" (p. 133), the argument is only placed in its historical context in the very last chapter. Again, the structure of Part II is unfortunate, and the separate chapters are not sufficiently integrated with the title chosen for the section "The Entrepôt Economy". It is a pity that the author is so guarded in his forecasts concerning the future of this "traditional source of income", but by assessing the changing patterns and methods of international trade he infers that the future of Hong Kong must rest mainly in the field of industrial development.

In fact it is a characteristic of this book that although many stimulating problems are raised the author makes little attempt to resolve them. For instance, in the first chapter too fleeting a comparison is made between Hong Kong's economic development and that of Singapore, Macao and Taiwan. A second example may be taken from the opening chapter: "Other elements of institutional character, such as the Chinese social structure, which presents a close network of families, clans, secret societies, religious sects, professional, cultural or charitable organisations, as well as various deep-rooted traits of ancient Chinese philosophy . . . all would have to be included in a complete analysis of Hong Kong's recent economic growth. These factors, however, belong to a realm beyond the reach of the crude tools which an economist has been trained to handle". In discussing

"The Nature and Mechanism of the Industrial Revolution" (Chapter 6), another most profitable field of research is suggested when Mr Szczepanik compares the lot of the industrial worker in Hong Kong with his mainland counterpart: "This comparison shows that the standard of living of industrial workers in Hong Kong, low as it is, is much higher than in China. This explains why the Colony has been constantly receiving, apart from political refugees, an inflow of economic immigrants from the mainland". One wonders if the chain of cause and effect is not here presented in too facile a manner?

It should be pointed out that there is a striking similarity between the content, and even the actual text of Mr Szczepanik's book, and that of the *Hong Kong Annual Reports.*

A particularly disappointing omission is the lack of a fuller analysis of the sources of overseas investment, for Mr Szczepanik tells us that the average annual inflow of capital from abroad has been the equivalent of £65 million per annum between 1947 and 1955, or, on average, 40 per cent of the national income. A far more detailed analysis of the source and conditions of this investment is surely essential before predictions can be made as to the future growth of Hong Kong's economy.

MICHAEL FREEBERNE

THE MANNERS AND CUSTOMS OF THAILAND

Thomas M. Fraser, Jr., *Rusembilan: A Malay Fishing Village in Southern Thailand,* Cornell University Press, New York, 1960, pp. xviii, 281, $5.75. Foreword by Lauriston Sharp.

Howard Keva Kaufman, *Bangkhuad: A Community Study in Thailand,* Monographs of the Association for Asian Studies, J. J. Augustin, New York, 1960, pp. ix, 235, $5.50.

Though prepared by trained observers, these two monographs are not unlike the reports of manners and customs brought back from exotic lands by nineteenth century travellers: the data presented are heterogeneous and often superficial, the concepts in terms of which the authors attempt to manipulate their data are entirely conventional and often imprecise and both monographs lack sharp theoretical focus.

Fraser worked at Rusembilan in southern Thailand for eight months, watching and discussing daily village routines, attending village functions, and conversing informally in the coffee shops, presumably in the Malay language. He wished to discover "how Rusembilan and other Malay communities were integrated into the natural [*sic*] structure of Thailand and how the social structure and cultural pattern reacted to points of stress in the process of integration". He wished also "to investigate the process of change occurring in the community and to determine what differential factors were operative in the process". Despite these professed aims, all but two chapters are purely descriptive.

Accounts of fishing and agricultural techniques at Rusembilan (Chapters IV and V) may interest geographers. The chapter headings refer to the "economy" of fishing and agriculture; but there are few specifically economic data apart from the local prices of equipment purchased and produce sold, and there is no specifically economic analysis of any kind apart from some superficial descriptions of productive organisation and marketing procedures. The material is mainly technological.

Chapters VII and VIII are devoted to social and political organisation. The former contains an account of relations between villagers and government officials. The latter sets out some perfunctory observations on kinship terminology, "respect

and authority", social groups, and feasting. The sociological materials lack the rich texture that only prolonged and intensive field work can supply: there are no case studies; no texts; no account of the ambitions, interests and motives of sample villagers; no distinctions between ideological precepts and actual practice; no analysis of power or the pursuit of power; no genealogies; and few detailed statistics. The author's field enquiries have been neither sufficiently intimate nor sufficiently systematic. Most social anthropologists could write a book like this after eight months' field work, but nowadays few care to do so.

In the two final chapters Fraser offers some theoretical discussion of his field data. "The orientations of the culture . . . are conceived to be the largest consistent units that can be derived from the culture. Each is made up of several series of smaller units, the smallest of which is the individual 'culture trait'. . . . Individualistic and communal orientations are considered, and then the polarity between them and how it operates in the culture" (p. 219). What it all amounts to is that in economic affairs the people of Rusembilan tend to consult their individual interests while in the affairs of the Church they seek to promote the interests of the whole community. At Rusembilan "there exists a basic polarity between the orientations of the individualistic type and those of the communal type" (p. 225). Where does there not?

Kaufman's study of Bangkhuad, a Thai Buddhist community, has no theoretical pretensions. After spending "200 days and 7 nights" in the village, where he worked with an interpreter, though he himself spoke Thai, he has gathered together data on all aspects of village life, with special emphasis upon village Buddhism. His data are more detailed, more precise and more comprehensive than Fraser's, but just as heterogeneous. One single chapter contains sections entitled "Dress", "Diet", "Drinks", "Betel Chewing", "Smoking", "Entertainment", "Games", "Health", "Knowledge of Sanitation" and "Attitudes Concerning Food and Health", "Narcotics", "Preventive Medicine", "Miscellaneous" and "Black Magic". Kaufman calls this "the camera approach", meaning presumably that it records everything that comes within view; he anticipates that some day, as a result of this approach, his monograph "will serve as resource material for comparative studies".

Both books do in fact place useful information on record. The most valuable parts of Fraser's book are his accounts of fishing techniques and of Islam in Rusembilan. Kaufman's description of rice cultivation and his detailed account of the local Buddhist church will also attract attention. In addition, each book places on record a thousand and one minor ethnographic "facts" that may be useful to someone, some day.

MURRAY GROVES

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W. Howard Wriggins, *Ceylon: Dilemmas of a New Nation,* Princeton University Press, Princeton N. J., 1960, pp. xiv, 505, Maps, Bibliography, Index. $10.

This is a good book, thoroughly to be recommended to all those who are concerned with the study of political, social and economic affairs in newly independent and underdeveloped countries, especially those of Southeast Asia. The author, who is chief of the Foreign Affairs Division in the Legislative Reference Service of the Library of Congress, has spent some time in Ceylon and has manifestly got completely to grips with the Island's affairs.

Part I of his book begins by sketching the historical, geographical, social and economic setting of Ceylon politics. Mr Wriggins is particularly and rightly concerned here to examine the social and economic system that provided "the

underlying groups, resentments, and aspirations that give direction and impetus to political activities" (p. 7). This he does with a general sureness of touch which, however, very occasionally falters: for example, malaria is described as formerly endemic over most of the island (p. 52) whereas this is only true of the Dry Zone. Mr Wriggins goes on to describe accurately and succinctly the constitutional evolution of Ceylon under British rule (but there is a curious slip on p. 88, where Ceylon government expenditure on social services is described as "Federal aid"!); and concludes Part I of his book by discussing "The dynamic actors on the political stage": political parties, individuals, and various group interests.

Part II of the book examines five of the fundamental and teasing problems that have afflicted Ceylon since independence. The first of these involves religion and cultural nationalism, two interrelated phenomena whose rise and exploitation had much to do with the success of Mr Bandaranaike in the elections of 1956 and with the ensuing communal tensions. The second problem is that of national unity, which is bound up with the relations between the majority Sinhalese community and the Indian and Ceylon Tamils and in particular the objections of the latter to the language policy of Mr Bandaranaike. In discussing these issues Mr Wriggins is, perhaps, a little too prone to idealise the role of the Buddhist priesthood and of other leaders of the religious and cultural revival: a little too willing, that is, to see their motives as single-mindedly religious and cultural and a little too unwilling to see in these movements the desire of a frustrated group for power and for the economic opportunity of which it thought it had been deprived.

Mr Wriggins then turns to his third problem, that of economic development, which, he emphasises, is inseparable from policy. Resources, natural, financial and human, are adequately surveyed, and successive Government policies are reviewed. The author has clearly mastered a wide range of material, though his grip on agrarian affairs is not quite as tight as one might wish.

Mr Wriggins' fourth problem is that of the practice of democratic elections: he examines the Ceylon general election of 1956 which, for the first time in a newly-independent Asian country, led to a peaceful change of government through the agency of the ballot box. Finally, he discusses Ceylon's search for foreign policy and its relationship to such issues as Asian solidarity. His conclusion attempts to make generalisations from his study of Ceylon about the important characteristics of an Asian polity.

One closes Mr Wriggins' book with a sense of deep admiration for his erudition and for his sympathy with the scene he has been painting; but also, to a much smaller degree, with the feeling that he is, or represents himself to be, a little more the earnest innocent than truth about Ceylon requires.

B. H. FARMER

"OUR LITTLE LIFE"

Kenelm Burridge, *Mambu: A Melanesian Millennium,* Methuen, London, 1960, pp. xxiii, 296, Illustrations, Index. 42s.

Dr Burridge visited the society of Tangu, in Northern New Guinea, in the early fifties to gather material for a doctoral study. He has now presented us with a perceptive and stimulating book analysing one of the messianic movements known collectively as "cargo cults". Mambu, from whom the book takes its title, was one of the prophets whose ideas were developed by the Tangu people and some of their neighbours.

The literature on cargo cults is now growing apace, and many anthropologists wonder whether anything new can be said about it, unless the examination is

predicated on new data or new methods. Dr Burridge has demonstrated that many of the unsolved questions and fuzzy answers can be approached afresh. Because of the depth at which he penetrated Tangu belief, his abiding yet objective sympathy with the Tangu people, and his personal interest in the ideas and concepts of religious systems, he has been able to present the world view and the ideational system of the Tangu with greater persuasion and authority than has been achieved in recent New Guinea anthropological studies. In reaching this goal he has been able to put aside once and for all some of the old misshapen questions. (Is cargo cult thought rational or irrational? Can a single-cause explanation apply?)

The concept upon which Dr Burridge hangs his analysis is that of the myth-dream, a body of ideas which grows up as a result of numerous perceptual influences, and then serves, in dream-like manner, to embody aspirations and hence to influence action. Certainly, the analysis surrounding this notion, and the data which bear upon it, are full of import; but the idea itself is clumsy, and the extended explanation of it on pages 148-9 is the only incomprehensible section in the book. There are many notions in anthropology which relate to such a concept, and there is a greater need to sort out the existing ones, than to introduce novelties. Perhaps it is not a coincidence that Gregory Bateson (*Naven*) made his great contribution in a similar context when considering the motivational and ideational implications of a neighbouring New Guinea ritual.

It might be thought that in such a study the analysis of Western impact upon New Guinea society was marginal, to set the framework. Burridge has made it central, and has given it a new dimension. I doubt if there is as perceptive an account of the relationship between a native people and their European contacts anywhere else in the literature. The discussion here compares more than favourably with O. Mannoni's *Prospero and Caliban.*

The book should be judged on its constructive and creative merits which far outweigh any defects at which I might wish to quibble. Yet in view of the achievement, it is strange to find a number of dissatisfying points, injected or omitted without adequate explanation. There is, for example, no systematic treatment of ritual as such, although I am sure that ritual performed a central function in the movement, and that it must have been highly indicative of states of mind. And the indigenous inhabitants of New Guinea are throughout referred to as "Kanakas". I am sure that if Burridge uses the word it must be free of unworthy implications as used in New Guinea pidgin; but elsewhere in the Pacific memories of black-birders, and of plantation master-servant relationships have irrevocably coloured it. In a book of Pacific significance, the word should not be used. Again, on page 77 and thereafter, the term "manager" refers to the emergent leader. Managers to me are entrepreneurs; almost every Melanesian is in some sense an entrepreneur; no leader can be successful without being an entrepreneur. But Burridge is describing states of prestige and authority, in terms perfectly congruent with the detailed and unchallengeable accounts of Hogbin and Oliver; this is something wider and more significant than management *per se.*

The book is clearly, concisely, and evocatively written. It is a major contribution to Oceanic literature.

CYRIL S. BELSHAW

O.A.S. OR COMMON MARKET?

F. Benham and H. A. Holley, *A Short Introduction to the Economy of Latin America,* Oxford University Press, London, 1960, pp. 169 and maps. 18s.

During the nineteen fifties Chatham House published a series of monographs dealing with eight of the Latin American republics. The publication of a

companion volume giving a general survey of the economy of the area south of the Rio Grande is to be welcomed. It will form a valuable introduction to the region for those unacquainted with its background, endowment and problems, and it will give a framework in which the reader may assess and pinpoint in its continental significance the detail contained in the volumes on the individual republics.

Two authors are responsible for the book, Professor Benham covering the general economic background and H. A. Holley recent economic trends in the seven more important republics of Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela.

In the first half of the volume, in addition to the factual material on population and resources, some assessment is made of such vital matters as the place of agriculture in the economy, the part played by Latin America's industrialisation, the need for capital and the outlook for exports. Attention is also directed to the effect of changing terms of trade on the region's economy, and the feasibility of the establishment of a common market within the area.

Some of these assessments are remarkably succinct summaries of the economic trend or problem which a newcomer to the Latin American scene will find of great use, although sometimes the tendency to state the viewpoint of the conservative landowner and the foreign banker or investor at the expense of the other side of the picture weakens the objectivity of the presentation. For example, the merits of foreign investment in oil exploitation are given, but the method by which Chile has developed its oil resources from scratch without involving itself in foreign concessions is omitted. Similarly, although the author agrees that "the overall picture of agricultural production in the region is most disquieting" (p. 27), there is not only a reluctance to state the economic motives for agrarian reform, but instead the reader is presented with an itemised recital of reasons why land should not be redistributed. The critical observer is forced to wonder how Mexico's "total agricultural output doubled between 1945 and 1955" (p. 126) in spite of the vast redistribution of land that occurred there!

In like manner everyone would agree with Professor Benham's conclusion (p. 56) that the development of agricultural land, oil or other minerals is preferable to the investment of large sums in industries *for which a country is not naturally suited*. But a great deal of Latin American industrialisation does not fall into this category; and no Latin American economist (with memories of the nineteen thirties) sees much hope in increased agricultural or mineral production which would exacerbate both the problem of commodity surpluses and the reliance of the area on fickle world prices, from which even diversified producers such as Peru as well as "single-export" republics such as Chile have suffered.

Indeed, the second part of the book, dealing with the seven more important republics, has a more objective ring about it. Here we have a series of highly readable critical essays which provide the reader with a splendid summary of the post-war economic history of the major areas of Latin America. They also portray vividly the increasing diversity of development now characteristic of the continent and the trends or requirements of each of the seven republics. Particularly attractive are the diagnostic conclusions such as the need for "the simultaneous expansion of arable and pastoral farming" (p. 100) in Argentina; "Brazil's eventual emergence as a major industrial power" (p. 108); Chile's need for "the development of agriculture and the diversification of the country's export trade" (p. 117); Colombia's "extreme dependence on coffee for foreign-exchange revenue" (p. 124); and Mexico's "best all-round economic progress in Latin America during the past twenty years" (p. 134).

I dislike "overall" and "dieselisation"; and as a geographer, I wonder if the naivety of some of the maps enhances the publication. Surely with the availability of excellent atlas maps covering such aspects as relief and vegetation, more imaginative and illustrative cartographic efforts could have improved the volume.

G. J. BUTLAND

THE ROOTS OF RACIALISM

Man, Race and Darwin. Papers read at a joint conference of the Royal Anthropological Institute of Great Britain and Ireland and the Institute of Race Relations, with an introduction and epilogue by Philip Mason. Oxford University Press, London, 1960, pp. vii, 151. 18s.

This symposium, celebrating the centenary of the publication of Darwin's *Origin of Species,* contains essays on questions of racial differences and conflicts, which are dealt with by specialists from a variety of points of view.

The biological essays, which deal largely with the genetics of those physical characteristics which we call racial, are somewhat difficult to follow for the reader who is untrained in genetics. Their conclusions, though mainly negative, are nevertheless of the greatest importance. Thus in regard to miscegenation, biologists are unable to give any generalised statement as to its effects. They may be advantageous, disadvantageous, or "neutral". This conclusion disposes alike of the myth of the necessarily inferior character of the mixed blood and of the contrary assumption of "hybrid vigour". Again, there is no evidence that the physical features which we call "racial" are in any way correlated with mental capacities or characteristics. If any innate racial differences in intelligence do exist, they are of minimal significance compared with those determined by environmental (and particularly cultural) factors, or with variations *within* racial groups.

Dr Marie Jahoda's psycho-analytical interpretation of race relations, whether it be accepted in its entirety or not, is valuable as stressing the danger of interpreting racial tensions *exclusively* in terms of economic and social factors such as housing shortages, economic competition and alien habits. Of the Notting Hill riots in 1958 she writes: "The nine youths who went on a 'nigger hunt', thus starting the riots, were not suffering from housing shortage or unemployment. The mob who joined in the subsequent violence did not seek out those whose nightly amusements might have kept them awake. . . . The passion of hate which erupted in Notting Hill stemmed from deeper sources" (p. 66). It is indeed impossible to explain in purely economic or social terms the conclusions of Professor Hartley who made a study (in America) of "racial antagonism against three *non-existent* racial groups whom he called the Danireans, the Piraneans and the Wallonians. A large proportion of the people questioned about them disliked them strongly and advocated restrictive measures against them" (p. 68). Racial prejudice is to some extent "free floating" and stems in part from unconscious motives such as those which Dr Jahoda describes. The practical implications of this for the improvement of race relations are of the utmost significance, if somewhat discouraging.

Essays by sociologists and social anthropologists on particular situations of race relations and cultural tension deal with modern Britain (Dr Maurice Freedman), Africa (Dr Lucy Mair) and Asia (Dr Hugh Tinker). Of these perhaps the most significant at the present time is that of Dr Lucy Mair. Though written before the recent bloody happenings in the Congo, this essay reveals them as part of a more general pattern of tensions *between Africans* which are working themselves out less violently in other parts of Africa and are perhaps inseparable from the

movement towards independence, either within the Commonwealth or otherwise. Africans, like everyone else, "cannot tolerate having their lives controlled by outsiders. As long as the outsiders are British, they protest along with their neighbours. But when independence is near, they find that it is not likely to be 'freedom' in the sense of unlimited control of their own destinies. Hence there arise the kind of oppositions I have been describing" (p. 111). And these oppositions are economic as well as political. Thus most people know of the objections of African nationalists in Kenya to the situation in the White Highlands, where Africans are allowed to reside only so long as they work for Europeans. "Such people are in very much the same position as the immigrants into Uganda who work on the coffee or cotton farms of Ganda landowners. The Ganda too want the immigrants to stay in their country only so long as they are working; the Ganda too complain that you can't get a good day's work out of these foreigners; the Ganda too describe the labourers as 'dirty people', 'lazy', 'not really civilized', 'we couldn't let our daughters marry them' " (p. 112). There is a certain chill comfort in reflecting that we Europeans do not possess an exclusive monopoly of exploitation, irrational prejudice and xenophobia.

It is impossible in a short review to do justice to all of the valuable essays contained in this collection. Though none of them deals with the Pacific, they do provide a wide background of fact and criticism to problems which, being world wide, are of vital scientific and practical importance in this part of the world.

RALPH PIDDINGTON

New Contributors

A. Grant Anderson, Lecturer in Geography at the Palmerston North Teachers' Training College, has specialised in the geography of settlement in New Zealand.

Cyril S. Belshaw, Professor of Anthropology at the University of British Columbia, is the author of *The Great Village* and *Changing Melanesia.* He is an authority on the economic and social anthropology of Melanesia.

G. J. Butland, Professor of Geography at the University of New England, N.S.W., has lived in Latin America for 15 years. His publications include the Chatham House study of Chile, and *Latin America: A Regional Geography* (1960).

Murray Chapman, Research Assistant in the School of Social Science at the Victoria University of Wellington, is a geographer who has worked on resource utilisation and demography. He is interested in the Solomon Islands.

J. Dresch is Professor of Geography at the Sorbonne and is Editor of the periodical *Annales de Géographie.* His regional interests include Southwest and East Asia and the North African lands. His recent works include *La Méditerranée et le Moyen-Orient* (with P. Birot).

B. H. Farmer, Fellow of St. John's College, Cambridge, has specialised in the study of Asian agrarian problems. He is the author of *Pioneer Peasant Colonisation in Ceylon* and numerous articles on the geography of that country.

Michael Freeberne, Lecturer in Geography at Victoria University of Wellington, is specialising in the human geography of the Far East. He has spent a year in Hong Kong, and has a knowledge of Mandarin.

Murray Groves is Senior Lecturer in Social Anthropology at the University of Auckland, and has worked among the Motu people of Papua and among urban workers in Port Moresby. He is Editor of *The Journal of the Polynesian Society.*

Kōji Iizuka, Director of the Institute of Oriental Culture, University of Tokyo, has specialised in the economic and social geography of Japan. He visited New Zealand in 1959.

Sidney Klein, spent some time in Japan, Korea and the Philippines during and after World War II. He has written the book *Pattern of Land Tenure Reform in East Asia after World War II,* and numerous papers on economic problems in the Far East.

Y. L. Lee is Lecturer in Geography at the University of Malaya (Singapore). He has done extensive field work in Borneo and is specialising in historical geography.

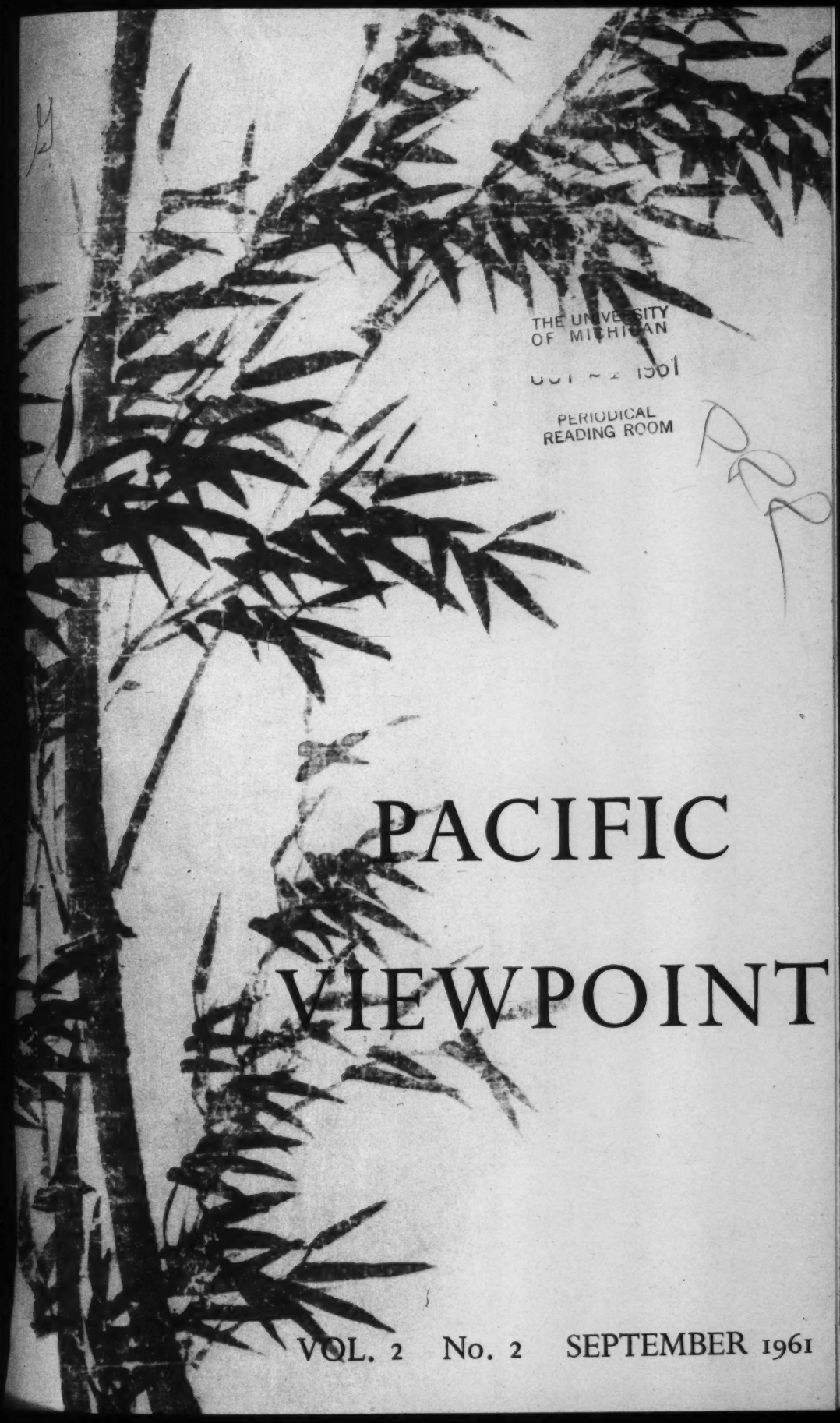
J. R. McCreary, Senior Lecturer in the School of Social Science at the Victoria University of Wellington, has been engaged in field work in the Urewera. He is senior author of the monograph *Parents and Children of Ruatahuna.*

Ralph Piddington is Professor of Anthropology at the University of Auckland. He has published books and articles in the fields of psychology and social anthropology, and is the author of *An Introduction to Social Anthropology.*

A. C. S. Wright has undertaken surveys of the soil resources of Chile, Fiji, Samoa and Niue for the respective governments. He has also done work on the geomorphological, soil and agricultural patterns of New Zealand and various Latin American countries.

R. F. Watters, Senior Lecturer in Geography at the Victoria University of Wellington, and *Ian Pool,* Research Fellow of the Department of Demography, Australian National University, have both contributed to *Pacific Viewpoint* before.

Technical assistance is by Mrs J. Elmes (secretarial), D. Hounsell, M. King and Mrs J. Benfield (photography), Mrs B. M. and Mr D. R. Winchester (cartography) and Thomson Photo Engravers Ltd. Translation assistance has been provided by Miss O. Duncan, Lecturer in French at the Victoria University of Wellington.



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